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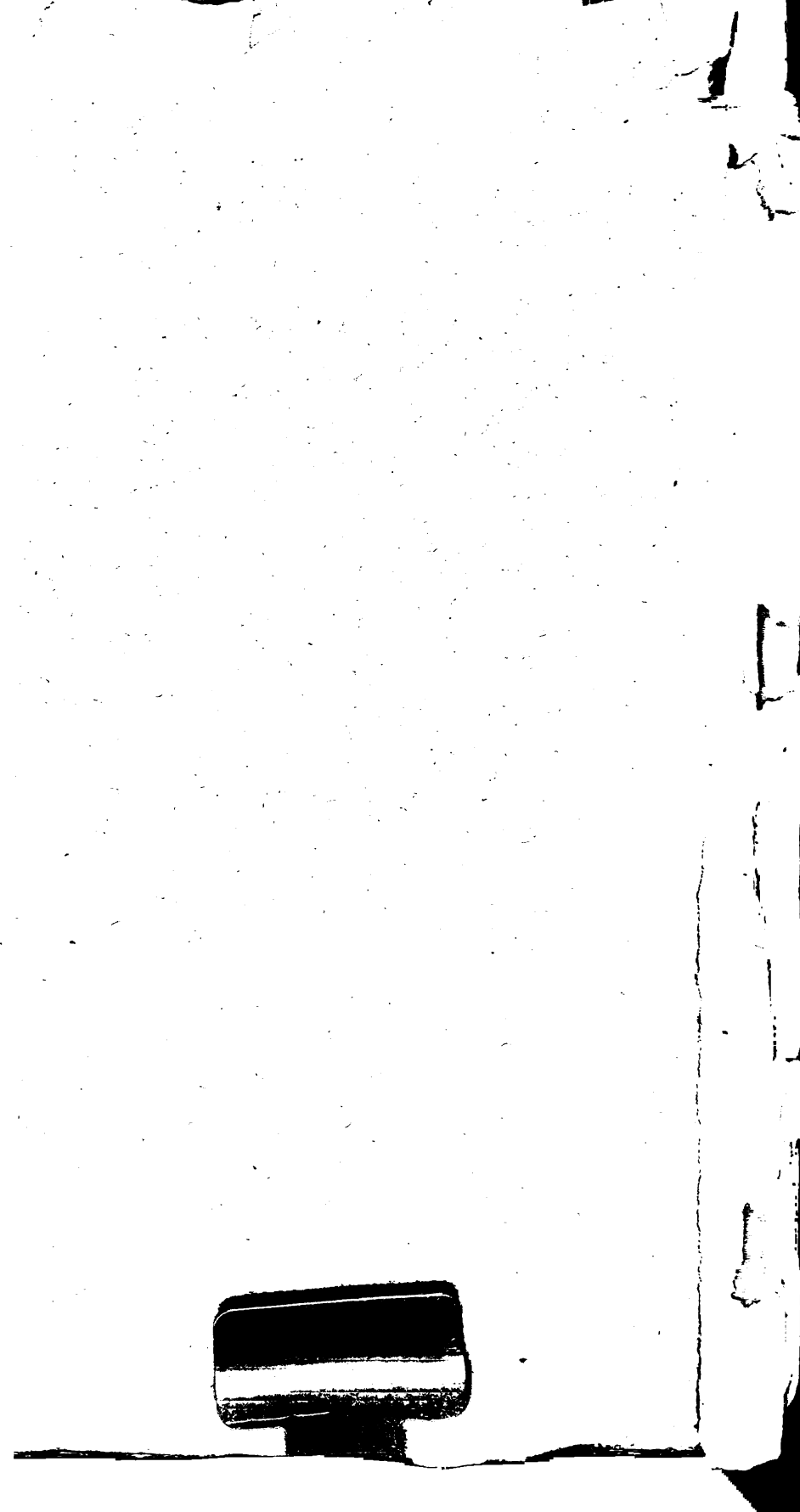
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THE BIENNIAL REPORT
OF THE
KANSAS STATE
HORTICULTURAL SOCIETY
Transactions.



RECORDING THE TRANSACTIONS OF ANNUAL MEETINGS HELD
DECEMBER 21, 22, 23, 1920, DECEMBER 21, 22, 23, 1921,
AND CONTAINING HORTICULTURAL
STATISTICS FOR 1920-1921.

VOL. XXXVI

TOPEKA, 1922

EDITED BY THE SECRETARY

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LETTER OF TRANSMITTAL.

OFFICE OF KANSAS STATE HORTICULTURAL SOCIETY,
STATE CAPITOL, TOPEKA, KAN., May 1, 1922.

To the Honorable Henry J. Allen, Governor of Kansas:

Conforming to the requirements of the law creating this Society, we are submitting the thirty-sixth biennial report of the Kansas State Horticultural Society. This Society has been a prominent factor in keeping the subject of horticulture before the citizens and in encouraging such activities as will produce for our people horticultural products grown within the boundaries of our state. We trust that it will meet with your approval and expectation.

W. B. VINING, *President.*

O. F. WHITNEY, *Secretary.*

OFFICERS AND MEMBERS.

OFFICERS.

W. B. VINING, President.....	Piper.
JAMES SHARPE, Vice President.....	Council Grove.
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Irvine, J. M.; Chicago, Ill.	

Faculty of the Kansas State Agricultural College, as follows:

The President.	Chair of Zoölogy and Entomology.
Chair of Chemistry and Mineralogy.	Chair of Household Economy and Hygiene.
Chair of Botany and Horticulture.	Chair of Industrial Art and Design.

Also Chair of Entomology of the University of Kansas.

LIFE MEMBERS RESIDING IN KANSAS.

Ahearn, M. F.; Manhattan, Riley.	Brazelton, John, jr.; Wathena, Doniphan.
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 Griess, W. S.; Lawrence, Douglas.
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 Perkins, R. H.; Turner, Wyandotte.
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 Rude, F. P.; North Topeka, Shawnee.
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 Sharpe, James; Council Grove, Morris.
 Sharpe, James, Homer; Council Grove, Morris.
 Skinner, J. H.; North Topeka, Shawnee.
 Skinner, R. E.; North Topeka, Shawnee.
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 Smith, Rev. Julius; Baldwin, Douglas.
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 Steele, R. B.; Topeka, Shawnee.
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 Sutton, A. H.; Independence, Montgomery.
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 Thompson, J. A.; Edwardsville, Wyandotte.
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 Vandever, Geo. A.; Hutchinson, Reno.
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 Vining, W. B.; Piper, Wyandotte.
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 Whiteker, Geo. P.; Topeka, Shawnee.
 Whitney, Mrs. E.; Topeka, Shawnee.
 Whitney, N. R.; Topeka, Shawnee.
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 Willis, A. E.; Ottawa, Franklin.
 Worden, Ernest; Wellington, Sumner.
 Yaggy, E. E.; Hutchinson, Reno.
 Yates, Ed. L.; Troy, Doniphan.
 Yaw, Frank; Wichita, Sedgwick.

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Barnes, J. T.; Hansen, Idaho.
 Chandler, C. A.; Kansas City, Mo.
 Claassen, P. W.; Ithaca, N. Y.
 Daniels, Ezra T.; Amber, Okla.
 Eames, W. B.; Grand Valley, Colo.
 Fosnot, W. E.; Keosauqua, Iowa.
 Griesa, A. H.; Santa Rosa, Cal.
 Hayes Pump & Planter Co., Galva, Ill.
 Holsinger, C. V.; Ames, Iowa.
 Hitchcock, Prof. A. S.; Washington, D. C.
 Lux, Geo. P.; Los Angeles, Cal.
 Lux, Phillip; Los Angeles, Cal.
 Merrill, Fred S.; St. Joseph, Mo.
 Mason Drug & Chemical Co.; Hancock, Md.
 Milliken, Robert; Nampa, Idaho.

Miller, E. L.; Kansas City, Mo.
 Newberry, Horace J.; Tulsa, Okla.
 Pelham, J. L.; Rosslyn, Va.
 Pratt, B. G.; New York.
 Rubart, Miss Lizzie; Batavia, Ark.
 Sherwin-Williams; Cleveland, Ohio.
 Showacre, P. G.; Cumberland, Md.
 Stark, Wm. P.; Neosho, Mo.
 Stephens, E. F.; Nampa, Idaho.
 Vansell, Geo. H.; Lexington, Ky.
 Wellhouse, Walter; Ames, Iowa.
 West, Geo. H.; Colorado Springs, Colo.
 Wild, Henry N.; Sarcoxie, Mo.
 Wilson, A. V.; Colorado Springs, Colo.
 Yaggy, A. F.; Hillsdale, Ill.

The following members have moved from the former address and cannot be traced:

Abner, Allen, College Park, Cal.
 Buell, D. G.; Hiawatha, Kan.
 Coombs, B. F.; Denver, Colo.
 Davis, John H.; Denver, Colo.
 Davidson, C. M.; Huntington, W. Va.
 Gray, E. M.; Durant, Okla.
 Godfrey, A. N.; Dayton, Wash.
 Hall, M.; Oklahoma.
 Harris, F. B.; White City, Kan.
 Johnson, Mrs. Geo. Y.; Portland, Ore.
 Johnson, Mrs. V. M.; Delto, Mo.
 Litson, W. H.; Wichita, Kan.
 Lyon, E. H.; Palisades, Colo.

Moburg, F. O.; Omaha, Neb.
 Moeser, Wm.; Spokane, Wash.
 Moser, M. R.; Wichita, Kan.
 Parker, Mrs. B. F.; Haviland, Kan.
 Plank, Prof. E. N.; Kansas City, Kan.
 (honorary).
 Roberts, H. N.; Perry, Kan.
 Sheffield, C. H.; Topeka, Kan.
 Shoe, L. A.; Highland, Kan.
 Taylor, E. A.; Houston Heights, Tex.
 Taylor, T. T.; Hutchinson.
 Weidman, J.; Oklahoma.
 Williams, J. W.; Holton, Kan.

ANNUAL MEMBERS, 1920.

Bacon, Mrs. J. A.; Holton.
 Daniels, A. T.; Topeka (deceased).
 Freienmuth, Wm.; Tonganoxie.
 Haney, Jesse; Topeka.
 Hood, Abner & Co.; Kansas City, Mo.
 Kelsey, Grant E.; Oakland.

Lytle, Wm.; Topeka.
 Nolte, E. H.; St. Joseph, Mo.
 Niles, Julia; Topeka.
 Owen, Geo. W.; Kansas City, Kan.
 Quisenberry, B. W.; Rodgers, Ark.
 Snyder, Carl; Topeka.

ANNUAL MEMBERS, 1921.

Bacon, J. A.; Holton.
 Hartung, John; Iola.
 Mackey, D. J.; Pittsburg.
 Niles, Julia; Topeka.
 Nolte, E. H.; St. Joseph, Mo.

Sherwin-Williams; Kansas City.
 Wiedorn, William S.; Manhattan.
 Williams, L. C.; Manhattan.
 Wilkinson, John W.; Topeka.

FOREWORD.

Fruit that a bountiful providence has created for man is a most wholesome, nourishing and sanitary food. The increased production and a more general use of this much-needed food has ever been the aim, since its organization, of the Kansas State Horticultural Society.

May the perusal of this volume call attention to the importance of horticultural products in the diet of mankind.

O. F. WHITNEY.

PROCEEDINGS.

PRESIDENT'S ANNUAL ADDRESS FOR 1920.

GEO. W. HOLSINGER, Rosedale.

The president's report at the last annual meeting was in the nature of an appeal to the horticulturists of Kansas to establish more fruit trees, shrubs and plants. I come before you a second time with a similar message.

When the secretary wrote that I was expected to make a report at this session (he dignified it by calling it an address), I immediately began to cast about for some idea which if presented here might be of value to the horticultural industry. In thinking over the subject as seriously as I could, it grew upon me that the one big problem before this Society is to interest the horticultural folk of this state to the point where enough of fruits will be planted to at least supply home consumption.

As heretofore reported, a condition has developed until we no longer produce, if we ever did, enough fruit to adequately supply the needs of our own people. This is the result of two causes: First, that in the last ten years orchards have suffered much from climatic conditions and neglect; second, that plantings have not kept pace with the decrease in acreage, to say nothing of the increase in consumption.

It is unnecessary for us at this time to enter into a discussion of the dietetical value of fruits. Every schoolboy has been taught that this wonderful and intricate machine, the human body, runs better and lasts longer when generously supplied with fruits; the eye is keener, the brain quicker, and the muscles more active, thanks to the gastronomic value of fruits. It is not only more healthful to eat freely of fruits, but it is cheaper than the constant use of meats and excessive use of the starchy foods.

Let us drop into a hotel to-day for a few minutes and take a look at the menu card. Here are prunes from Washington, oranges from California, grapefruit from Florida, bananas from Central America, apricots from Texas and cranberries from Massachusetts—but where is the big red Kansas apple which should be on every menu card in the state for at least one meal a day during the entire year? Inquiry into the subject will probably prove to us that it is more difficult to secure good Kansas apples than almost any other fruit, from the fact that our best apples are shipped to other states.

Now, please do not get the notion that I am "agin" the fruits shipped into this state from other sections. I delight in them all, from the "boarding-house prune" to the Thanksgiving cranberry, but it seems, oh, such a pity that people right here cannot get enough Kansas apples at a price that will enable them to have a supply on hand the greater part of the year.

Now, we know that Kansas is the great state of wheat and corn and alfalfa and cattle and hogs; but how many really know the possibilities of fruits in Kansas? How many know of the fine apples grown in the Arkansas valley? How many know of the immense berry crops of Wathena and Troy? How many know of the splendid orchard at Wallula, operated by our own good

vice president, Mr. Vining, with rows of apple trees a mile and a half long? And yet in the face of the success of these sections constantly before us, there is not enough fruit produced in the state to supply our own needs. Well, some one urges, it takes a long time to develop an apple orchard and bring it to maturity. Just so; it takes a long time to develop any sort of business, but it goes on indefinitely when once started.

Then there are other fruits which do not require so much time to produce paying crops. Strawberries fruit their best crops at one year. Grapes, blackberries and raspberries produce abundantly in three years, as does the gooseberry, if that thorny, spiney, sour, miserable thing can be called a fruit—for my part, I prefer to call it a substitute for something to eat. Peaches produce crops in three to five years. I once saw in Texas peach trees two years planted that yielded two bushels of well-colored, ripe fruit to the tree. Let us not forget here the plums, which often produce good crops when other fruits are scarce, and among these, for this section and farther north, the comparatively recent introductions of Professor Hansen, known as the Hansen Hybrids, are heavy croppers of good fruit. I saw two or three years ago here in Topeka ten varieties of these Hansen hybrids, and all were enormously productive. While these plums are rather more acrid than is pleasing to most of us, when preserved they are unquestionably a toothsome dish. Then, too, they come into bearing at a very early age, and, moreover, they crop well in sections where other fruit is not abundant. I have seen them growing in the nursery row with quite a good sprinkling of fruit, and at three or four years the limbs frequently bend to the ground under their loads.

It is a good practice in orchard planting to interplant with other fruits. All can then be cultivated at the same time, and this saves much labor.

One reason for our not having more home orchards planted may be that we have given our attention too largely to commercial plantings and too little to acre or home orchards. We have in these meetings heard frequently of "how" and "why" of commercial orchard planting, but I wish that more time could be given to the planting, cultivation and pruning of the smaller orchards, especially the one-acre orchard. There are few in this Society who are 100-acre men.

We are for the most part ten-, five- or one-acre men. That being the case, let us give at least part of our time to discussing the planting, the care and cultivation of the home orchard. There are reasons for wishing to develop the small-orchard idea in Kansas. Of course, when I speak of an orchard I wish to include in the discussion the pomes, stone fruits, vines and small fruits. It should include all—apples, pears, peaches, cherries, plums, grapes, raspberries, blackberries, gooseberries and strawberries—and no home orchard is complete without the entire list. The surplus from the home orchard finds its way to the tables of the people who live near by, while the produce of the large orchard is as apt to find its way to the seaboard as it is to find the home market, and as a general thing the better the fruit the less there is of it sold on the local market. So I am anxious that the people within the state may have a bountiful supply.

I wish it were possible to get the matter of fruit planting before the people of Kansas. There are many, many of our people who are willing and anxious to grow fruit if they just knew how to go about it. The Agricultural College

has representatives traveling over the state talking and encouraging and helping; the Farm Bureau is responsible for a lot of good work and is of great value; and still both are utterly inadequate in the matter of advising in horticultural matters, for ours is a technical business and requires much of professional experience and practice. Local horticultural societies do not seem to serve the purpose, for here the great difficulties arise of getting people to attend the meetings. Nurserymen, through their agents and catalogues, spread much propaganda and information, but here the great difficulty arises of getting people interested in the variety best suited to the particular location, for the catalogue to the novice in horticulture is often misleading or misunderstood, and the agent too often knows more of how to sell trees than of what trees should be planted and how cared for. With the great variety of trees offered for sale by the nurseryman, it would be surprising if the inexperienced purchaser received that which was best suited to his soil, location, elevation, slope, etc., world without end.

This State Society in some manner ought to endeavor to work out the problem for the individual (in so far as it can) as to what he should plant, where he should plant, how cultivate, prune, sell and market his product. You see I am outlining some job for Mr. Vining, and if he can in any degree give us a solution of the matter as to how we can reach the multitude of country and city folk who are interested or can be interested in fruit culture, the succeeding generation in this state will surely rise up and call him blessed. Nor will I put the whole job on his shoulders. It is your job as it is his, and you and I must help, and help a lot, if Kansas is to become ultimately all we expect of it as a fruit-producing state.

It will cost a lot in time and effort and work. But what is there that is worth while that does not cost a lot of effort? God said, "In the sweat of thy face thou shalt eat bread"; and apples come to us in the same manner. Theologians in years past have seen fit to accuse God of pronouncing this as a curse or a penalty. It is not. It is a promise and a benediction. What a wonderful way He has of providing for His people when they really try to accomplish things.

The Lord, who made heaven and earth and all that in them is, has put a high valuation on effort, and few things we really enjoy, if any, have come to us without a struggle. And so let us labor to increase in Kansas the production of those horticultural articles of food so necessary to the health of our bodies and so refreshing. It costs a lot, but it is worth it.

Great strength is bought with pain. From out the strife,
From out the storms that sweep the human soul—
Those hidden tempests of the inner life—
Comes forth the lofty calm of self-control.

Peace after war. Although the heart may be
Trampled and plowed like a torn battle field,
Rich are the fruits that follow victory,
And battle grounds the fullest harvests yield.

Strong grows his arm who breasts a downward stream,
And stems with steady stroke the mighty tide
Of his own passions. Sore the wrench may seem—
But only he is strong whose strength is tried.

To toil is hard; to lay aside the oar,
 To softly rise and fall with passion's swell,
 Is easier far. But when the dream is o'er,
 The bitterness of waking none can tell.

To float at ease, by sleepy zephyrs fanned,
 Is but to grow more feeble day by day,
 While slips life's little hour out, sand by sand,
 And strength and hope together waste away.

He only wins who sets his thews of steel
 With tighter tension for the prick of pain;
 Who wearies, yet stands fast; whose patient seal
 Welcomes the present loss for future gain.

Toil before ease; the cross before the crown.
 Who covets rest, he first must earn the boon.
 He who at night in peace would lay down
 Must bear his load amid the heats of noon.

—Ellen P. Allerton.

PRESIDENT'S ANNUAL ADDRESS FOR 1921.

W. B. VINING, Piper.

We have assembled here this 21st day of December, 1921, to celebrate the fifty-fifth anniversary of our Society.

As we reflect on the past we feel that we have no apologies to make. This is the pioneer Society of the West, founded by the founders of the state, and has always shown its fidelity to principle and right and has never shirked from duty. It has borne its share of taxation and has asked little in return. We owe a debt of gratitude to our members, led by Senator Brooke and others, who fought for our existence at our last legislative session. Those who were opposed to us last winter were not horticulturists, and do not know the possibilities of the state and have not taken into consideration the soil and its productive qualities and the source of revenue made possible by the advancement of the horticultural interests. In 1869 our first gold medal was won. In 1876 Kansas exhibited at the Centennial a greater number of varieties of apples than any other one exhibitor. In 1871, '72 and '73 this Society, still in its experimental stage, brought home from the Eastern States prizes for quality and beauty. On the 12th of November this year, at the peace conference at Washington, Dr. Charles M. Sheldon was introduced to Senator Lodge, of Massachusetts, who, learning that Doctor Sheldon was from Kansas, remarked that the best apple he ever ate was grown in Kansas.

Our attention in the past has been confined to producing new and better varieties and to securing those that are best adapted to our soil and climate. We must in the future turn our attention to lengthening the lives of our trees, that our investments may be more permanent. It is my belief that the short life of our orchards, and many of our diseases, come from the roots of the trees. We must have more and better roots in this climate. Our Julies and Augusts are hot and dry. Trees are bearing heavy loads, with restricted capacity to secure nourishment. In order to overcome this weakness in the root system we must prune heavily, as the top and root must balance in order to produce fruit. If the wood growth is too abundant for the root the tree

may blossom, but will not set its fruit; therefore, we must have an adequate root system to sustain the wood growth and also produce fruit.

We must prune our orchards for air and sunshine to combat fungous diseases, and yet have sufficient shade to protect the tree from sun scald.

Without thorough pruning we cannot do thorough spraying, which is the most essential part of producing perfect fruit. Too much foliage prevents the spray entering the home of the codling moth and other insects that absorb a large per cent of our revenue.

In order to combat insects we must spray at the right time and do thorough work. I believe that it is essential to use Paris green in the first two sprays in order to exterminate the first infestation of insects. A formula of 2 pounds of Paris green, 8 pounds of arsenate of lead and 2 gallons of lime sulphur to 200 gallons of water should be applied as the petals are turning brown and before they drop. By this time the breezes have scattered the pollen and the apples have set. For the second spray we should reduce the Paris green to 1 pound, and not use it at all on Grimes Golden and other light-colored apples.

By thorough pruning and thorough spraying Kansas produces the finest fruit in the world. And yet our orchard ground is producing corn and wheat, and we do not stop to consider that the price to-day of three Delicious apples will purchase a bushel of corn. Why do we go to New York for the Baldwin, Greening and other hard apples, or to the western slope for the Jonathan, Grimes or Delicious, which are beautiful to look at but disappointing to the palate? The Kansas apple, like the prophet of old, is not without honor save in its own country. Let our slogan for the future be, "Kansas for apples, and Kansas apples for the world." Nature has provided abundantly with climate and soil, and it is up to us to produce and place on the market a fine quality of fruit.

Packing is a very essential part of our business. The size and kind of package is not so important as grading and culling. An honest pack is our best salesman. Apples with the Kansas flavor, color and size, and rightly packed, will go to the best trade and secure the best prices.

We must progress to higher standards of values. Wages must remain higher than prewar scales. We cannot produce the necessities of life as formerly. We have passed from the preemption period and government land grant to high-priced farms and almost unbearable taxes. We have passed from the sod house and the log cabin and now live in modern homes. We are educating our boys for masters and our girls for the highest stations in life. We cannot return to peasantry, but must advance, and with all of our advancement we must remember and teach that the most honorable thing in the world is work, and that it is our desire that our boys and girls shall remain on the farms and obey the first command—till the soil. But our marketing system places the profits from our labors in the hands of others rather than in the hands of the producers, thus rendering the business of the farm unattractive to many. In marketing our produce it is necessary for us to keep thoroughly posted on conditions; that is, the supply and demand. In my judgment we cannot rely upon government reports as yet. The government has not the proper source of information. Politicians and land boomers do not make good reporters. We must organize and give the govern-

ment all the aid possible, and I would suggest that the secretaries of the societies of the various states submit names of persons in the several districts to furnish the government with accurate reports. The *Kansas City Packer* spends large amounts of money every year to secure and give this information to all of its readers. This paper should be in the hands of every producer.

I can only suggest our needs in the few minutes that are allotted to me at this time, but as I look at our possibilities, our schools of instruction, our survey of soil, our experiences of the past, I see no reason why we should not grow an abundance of apples, pears, berries and grapes. The horticultural interests in Kansas are not an adventure, but a substantial investment.

PRODUCTION OF APPLE AND PEAR SEEDLINGS.

I. M. ORNER, Oakland.

The growing of apple seedlings is an important industry in the Kaw river valley. It is estimated that 90 per cent of all the seedlings grown in the United States are grown within a radius of twenty-five miles of Topeka. The commercial crop consists of apple and pear seedlings. Practically all of the seed for apple and pear seedlings is imported from France and Japan. The apple seed is supposed to be from a variety of French crab. The preparation of this seed for the market is an important industry in France, and the process of extracting the seed from the pomace without crushing it is unknown to the American people. The apple seed received by growers in this vicinity is shipped from a distributing center on the Atlantic coast, and this distribution point is nearly always the city of New York.

The seed arrives packed in charcoal in large barrels, and is separated from the charcoal by using a fanning mill. The seed is then soaked in clear water for forty-eight hours, after which it is packed in ice until time of planting, when it is dried sufficiently to readily pass through the seeder which is used in planting the seed. An ordinary wheat drill is used to plant the seed in rows twenty-four inches apart. This planting is done during March and April. The seed is covered to a greater depth than other seed of this size. This is for the purpose of keeping the seed bed moist, which aids germination. As soon as the seed is sprouted the extra covering of earth is removed by a stroke of an ordinary garden rake, and cultivation starts immediately.

The first cultivation is given by using a wheel hoe. Care must be taken to prevent the forming of a crust, which when disturbed is apt to break the taproot, which prevents the growth of the young seedlings. A man will wheel-hoe about one acre a day the first time the seedlings are cultivated. A specially prepared horse cultivator is made that will cultivate half as many rows at a time as there were planted at a time with the seeder. Small mules about the size of cotton mules are perhaps the best power that can be used for drawing this cultivator. When the weeds start after the cultivation begins, weeding must also be started. Seedlings are one of the crops that will not tolerate weeds at all. Boys from ten to fifteen or sixteen years of age have proven to be the best weeders obtainable.

The work is not very difficult if the weeding is begun at the proper time. The crop is cultivated about ten times during the season. Cultivation must be given, just as soon as the condition of the soil will permit, after each rain. The crop must be weeded as often as the weeds begin to show in the rows—about three times during the growing season.

Apple and pear seedlings are usually grown on the ground which is generally prepared the previous fall by extremely deep plowing—twelve to fifteen inches. This enables the seedlings to make a long straight root, ordinarily growing down as deep as the ground is plowed. The seedlings make a part of their growth during the late fall and continue to grow to the time of severe freezing. When the weather is favorable the harvesting of the seedling crop begins about the first of November. The seedling growers have a very ingenious digger, which consists of a blade of steel about ten inches wide at the bottom and bent in the shape of the letter V, to which are fitted a plow beam and handles. At the bottom of the V there is welded a riser, which pushes the seedlings up two or three inches in the loosened ground. This enables them to be quite easily pulled. As the seedlings are pulled they are placed in bundles of about 100 each. These bundles are tied with tarred string and lightly buried in the soil, and remain there until gathered by the haulers. The bundles are taken to a cave or cellar, where the seedlings have a part of the top removed, heeled in, and then covered with a mixture of straw and manure to prevent freezing, and are left there until they are graded. The seedlings are graded into several classes: one-fourth inch, three-sixteenth inch, two-sixteenth inch, and one and one-half sixteenth inch.

The great advantage of the Kaw river soil is that here can be grown seedlings which are capable of being cut into several grafts, which form the piece-root grafts for the great majority of the apple and pear grafts that are planted in the United States. Apple seedlings and pear seedlings grown in this territory are shipped to all parts of the United States and Canada where grafting is practiced. The greatest growers of seedlings in the United States have their headquarters in Topeka. Although the soil in this territory is especially adapted to the production of seedlings, it is not profitable to raise more than two successive crops of seedlings on the same ground. Several years must elapse before that piece of ground is again planted to seedlings. Land must have sufficient fertility to produce a large growth of wood for this crop. It is not unusual to dig 100,000 apple seedlings from an acre of ground.

The producing of apple and pear seedlings is not very complicated or difficult, and if one requires only a few thousand it will be better to have the professional grower produce them. Seeds from native apples will produce good seedlings. The great trouble is in preparing the seed that a crop may be produced from them, and until there is some improved method for separating the seed from the pomace we will be compelled to import our apple and pear seed.

DISCUSSION.

JAMES SHARPE: Why is it that the greater per cent of the seedlings are grown near Topeka?

SECRETARY WHITNEY: Because our soil is peculiarly adapted to the grow-

ing of seedlings. We can plow to any depth, as the soil is a made soil, and the longer the roots the more grafts that can be cut from a seedling. The ideal seedling for grafts is a long, straight root without laterals.

A MEMBER: I want to know the difference between the piece-root and the whole-root system, and the advantage.

JAMES SHARPE: I have given this matter special attention and I do not see any difference.

PROF. E. G. KELLY: As a matter of fact, I find very few nurserymen who are using the whole root. Practically all in this part of the state are using the piece-root graft. In such apple states as Iowa and the Northwest about 90 per cent grow the whole-root system, but our nurserymen are using the piece-root graft. Now and then a few are using the whole root, with practically no difference in results.

THE HOME ACRE ORCHARD.

E. G. KELLY, Extension Entomologist, Kansas State Agricultural College, Manhattan.

The home orchard of the farmer has long been recognized as an important factor in rural home building. Farm real-estate dealers always point with pride to the few fruit trees about the premises, and even the city man looks for the trees. A small orchard has sold many a farm to the housewife, who in fact is, or should be, satisfied with the bargain.

During the year just past I have come in contact with about eighty home orchards on Kansas farms. Some of these were pruned and sprayed and produced fruit for the first time since planting. Some of the home orchards have had very good care and have been furnishing fruit for the family several years, with some to sell, and many orchards have been neglected.

The varieties in many of the bearing orchards are good, having been selected with care and with the idea of a home orchard. In one sixteen-year-old orchard of twenty-two trees, I found Red June, Liveland Raspberry, Yellow Transparent, Wealthy, Maiden Blush, Jonathan, York Imperial, Grimes Golden, Winesap, and a variety similar to the Ben Davis. The owner of this orchard has been buying fruit for family use all these years. This year he pruned and sprayed and had plenty of fruit to use and more than a hundred bushels to sell.

Another example of selected varieties of a producing home orchard is Maiden Blush, Early Harvest, Pewaukee, Belleflower, King David, Jonathan, Stayman Winesap, Winesap, Delicious and Mammoth Black Twig. This orchard is fourteen years of age and has been producing some fruit for six years, and this year it produced a normal crop.

In many of the orchards on farms these good varieties will be found. Other varieties of apples quite often found are Ben Davis, Dominie, Huntsman, Minkler, Missouri Pippin and Ralls. One very interesting observation is that in most of the home orchards peach trees were set, but few are left, the trees having died before producing a crop.

Plums were always a part of the home orchard, yet few are living, and of those still living few are bearing, because of lack of care. The Damson plum

has made good where many other varieties have failed. Cherries form another part of the average home orchard and are consistent and regular bearers.

In the twelve northeastern counties of Kansas there are home orchards on 19 per cent of the farms (this does not include commercial orchards). The other 81 per cent have soil and climate quite the same.

Where the soil and climate are good there are many good reasons for growing fruit at home. In the first place, it is at home where it is needed; and in the second place, if it is not grown on the farm it is not often there at all. Many a farmer will say that it is cheaper for him to buy fruit than it is to grow it. It is, for he seldom buys; his family does without.

"The Home-acre Orchard" project, as reported at your last session, was organized to stimulate setting out orchards on this 81 per cent of farms. In 1919 there were sixty-three of these orchards planted; in 1920 there were thirty-six additional orchards put out. Of these ninety-nine home-acre orchards the writer supervised the management and setting of thirty-three in 1919 and thirty in 1920. The others were under the direction of H. Simonds and L. C. Williams.

The thirty-three orchards planted in 1919 under my supervision grew very nicely during the first season. The first fall and winter were disastrous to five of the orchards; rabbits practically ruined three, and farm animals two; eight others were slightly damaged by rabbits and flat-headed borers; and the other twenty were in fine condition in the spring and are in first-class condition at this writing. The growth of the trees in 1920 was more than we expected.

In one orchard where two-year-old apple trees were set in a five-acre commercial orchard beside the one-year-old trees of the "home-acre orchard," the one-year-old trees have grown much faster and have better form than the two-year-old trees.

The thirty orchards planted in 1920 under my supervision have made excellent growth; much better in most cases than those of 1919 setting. Rabbits and borers were the worst enemies for the young trees, and every effort has been made to get farmers to put wire netting about trees for protection.

This project of home orchards will be continued in 1921. We hope to put out fifty or more "home-acre orchards" in Kansas, and hope thereby to stimulate the planting and better care of orchards.

DISCUSSION.

SECRETARY WHITNEY: I see a lot of young men here who are evidently interested along horticultural lines. Mr. Kelly is very enthusiastic on this acre orchard, and I think it is one of great importance. This is the third year that Mr. Kelly has given us a talk on this topic, and I would like to have some discussion about this acre orchard, which is meeting with great success; but I want to say this before we start the discussion: The idea of the acre orchard was that every farmer should have the apples that he wanted, and for that purpose they selected certain varieties, and they had a certain way to plant them and a certain way to cultivate them and spray them and all the particulars that go to produce this acre orchard. The orchard did not consist entirely of apples; there were cherries and pears, and where the location was right, some peaches. I wish to say to the boys that there is

nothing more interesting in the way of agriculture to-day than the horticultural branch. It is a fact that fruit is a necessary food that mankind must have, and that it requires just a little more intelligence to raise fruit than it does to raise some other things, so that it is well worthy of all the attention that these boys can give to it. Orchardists present can give you some information along the line of the acre orchard, that is just another name for the home orchard. If you would ask me about it I would say it was entirely feasible and should be encouraged. The mistake that has been made with so many farm orchards is that they were too large. The trees were cheap and set into big orchards, and the farmer did not have time to take care of large orchards. The farmer will say, "I do not want to bother with an orchard; I can buy my fruit cheaper." But he cannot. If he is producing, he is producing something that is wholesome and something that has great value. If he buys it he does not have enough. There are practical orchard men here who plant trees, and they will be glad to tell you something about the home orchard until Professor Kelly comes with his acre-orchard information.

W. A. S. BIRD: I would like to have Mr. Whitney tell these boys something worth while. Tell them what kind of trees to have in this home orchard.

SECRETARY WHITNEY: In planting the home orchard you must take into consideration that you want early fruit, just as early as you can get it off the tree, and then varieties that will keep until July in common storage—home storage. Some of them will say that it does not pay to bother to fix this up at home, but it does. I believe that we can make arrangements to hold our fruit on the farm just as well as any place else, with a little care; but it requires care. In this matter of storage I find that a good dirt wall is preferable to any other kind of a wall, because it absorbs moisture and gives off moisture, so you have your humidity better than in any other place. I find that the dirt wall without any floor whatever is the best place to keep certain kinds of apples. We want the first early apples that we can get. Nothing better than the Yellow Transparent. The Yellow Transparent has the habit of ripening its fruit over quite a period and not all at once; this is an acceptable trait for home convenience. From the time of the Yellow Transparent to the Grimes and Jonathan may be supplied by such varieties as Duchess, Red June, Liveland Raspberry, and some others as preferred by individual taste. The Wealthy is a valuable apple, especially for the home orchard, as it ripens a short time previous to the Jonathan. The Winesap will come as near to furnishing apples from the Jonathan time to the Yellow Transparent time as any apple that is a tested variety.

PROFESSOR DICKENS: I would not plant all apples, but would plant some cherries and plums. The peach demands a well-drained soil, and will grow in no other. There should be in the orchard some Champion, Crawford, Belle of Georgia and Elberta, and possibly some Mountain Rose. You can afford to plant peaches in Kansas if you are a gambler. The cherry ought to be in every orchard, if you do not have anything else. Plums will grow anywhere. I do not care what your soil is, if you will plant some Damson and Pottawatomie and a few Miner, and possibly Wild Goose, you will have plums every year.

SECRETARY WHITNEY: Professor, you do not recommend in an acre orchard all the varieties that you have been naming?

PROFESSOR DICKENS: No, sir; oh no; I would not recommend all those. Of course that would be too many.

W. E. BOSCHEN: The home orchard will be absolutely a failure until we have a Farm Bureau to look after it and inspect every tree that is to be planted. It is bound to be a failure, because land with different slope or different soil would require different varieties, and you cannot make any hard, set rule of any certain varieties for planting an acre orchard, because if you take a north slope it will have to have a different apple from a south slope, even with the same variety of soil. It would require an expert to tell the soil, and the varieties and the location would have to be considered.

PROFESSOR DICKENS: Mr. Boschen has started a subject that is—well, I don't know how big it is. I know of an experiment-station man in Massachusetts, and one thing that he did was to select locations for growing apples of particular quality. This is a great question, the adaptation of varieties to soils. The ascertaining of the soils in which these apples attain their best quality is one of the possible duties of the American horticulturist. There isn't a successful commercially grown apple in Kansas that I know of that isn't thick-skinned. There are a lot of men who ought to be looking after these little orchards—the man who is beginning to get a little old. If you are thinking about laying off from work in town you had better get one or two acres and plant stuff that it pays to look after. It is just another kind of sport, and yet a kind of sport that means money in your pocket and health to your mind and body. It is a big question, this question of spraying, and the question of varieties and soils and location.

MR. BENNETT: I am for the acre orchard and also against the acre orchard. If the acre orchard was started under the direction of some of these fellows from the college that would take this land and set out this orchard, I think the acre orchard would be a fine thing; but I think to start out and induce and encourage every man to start an acre orchard under present conditions would be one of the worst things to do. There would be six or eight failures out of every ten trials. I believe we all ought to have a man that understands the acre orchard to help us in our work, and then I believe we would make a success of it.

E. G. KELLY: My job in Kansas is growing better fruit, not only in commercial orchards, but in the home orchards. I am absolutely sold to my job. I believe that our 19 per cent of farm homes in eastern Kansas which have farm orchards are entitled to our support, as well as the commercial orchard men, and the commercial orchard men are real experts on their own jobs. Our orchard, our home-acre orchard—we call it the acre orchard because that is about the average size that the farmer plants—about 19 per cent of the homes in eastern Kansas have these home orchards. During the last year I have visited and worked with eighty of the home orchards. A lot of them are absolute wrecks. There should be a law in Kansas compelling those men who will not take care of those old orchards to cut them down. He is a detriment to the state and a nuisance to the fruit industry, and a part of my job is to get a law passed to make him cut out that old orchard or else make him take care of the curculio, the codling moth and the scab. Let

us get rid of this old home orchard or else let us show him how to take care of it. I remember last summer I was in Jefferson county, and I was asked by the county agent to make a talk to a bunch of farmers and endeavor to persuade them to take care of these old orchards. I absolutely know that a farmer must grow the fruit on his farm if he has any fruit on his farm. I had talked to audiences much larger than this and I had tried to make them believe, as I believed, that the farmer should grow the fruit, and I made the remark that the average farmer who has fruit in his home for his children grew that fruit on that farm; they do not buy it. If they do not grow it they will not buy it. When the meeting was over I saw coming up the aisle a great, big man leading a little girl. Well, that wasn't anything out of the ordinary, because after all of these meetings we have these little after meetings which are always very interesting. This man came up to me and shook his fist in my face and said: "You do not know anything about it. I can grow enough grain on half an acre to buy all the fruit I can grow on an acre." The little girl was looking up, and I said, "Do you like strawberry and cream?" She said, "I do not know; I never ate any."

JAMES SHARPE: Why have these trees only thirty-six inches high?

E. G. KELLY: That we may start a head about thirty inches from the ground.

JAMES SHARPE: Why not have them five or six feet high to start with?

E. G. KELLY: We want them only about thirty-six inches high for the best results, and if they are five or six feet high to start with and then cut back we do not have as good a chance of getting desirable trees. In Wyandotte county the nurserymen sent the farmer some whips one year old and eight feet tall, and when they were cut back to thirty-six inches not one lived. Buds on such trees below the thirty inches were dead on these particular trees. With tree whips about thirty-six inches high, we have some of the best buds from about thirty inches back. That is the best explanation I can give.

A MEMBER: How high would you have peach trees?

E. G. KELLY: Well, peach trees are different; about eighteen inches.

A MEMBER: What varieties of apples do you recommend?

E. G. KELLY: There are many good varieties. The idea of the home orchard, not the grower of commercial apples, is to have apples for the entire season, starting in the spring with the Red June, for instance, and followed with Yellow Transparent; then I believe the Wealthy, Grimes Golden, Jonathan, Winesap, York and Black Twig. Have two or three trees of each. We must plant different varieties for different communities. The man with the acre orchard must go to the expense of caring for it after putting it out, the same as one with a larger orchard. We have only tried this acre orchard for three years and do not know just what the result will be. Some of them have already blossomed. We are going to keep on trying, and will know later.

B. H. GRAGG: Where a large number of these orchards failed entirely, I want to ask if you considered the relative size of the farms on which they failed. What I have in mind is this: The farm is used for two purposes—one for revenue, and I do not believe the acre orchard would help much in this; the other is for home use, and here the acre orchard might do. I think

in twenty to forty years the acre orchard will be all right, but I do not think it is practical at this time. Too many of them fail.

E. G. KELLY: Yes; many have failed, for various reasons. Some wanted trees that would produce fruit almost immediately and were not willing to wait until a root system was developed; some because of lack of sufficient water, some became diseased and were pulled up, and some were abandoned for no reason at all. If you ever tried to do any experimental work you know that you expect to draw a certain number of blanks no matted how much care you give the experiments. We have tried to make these orchards as nearly model orchards as possible, and wanted to start the trees under the ordinary conditions and direct their growth. We expect to get blanks out of some of them. Use young trees; they are more uniform in results. We try to get a uniform type of trees. We have gotten some very good results, and we hope to use some of these orchards as models.

A MEMBER: What age of apple tree do you use?

MR. KELLY: The apple trees that we try to use are one year old. The peach, cherry and plum are two years old. Same from bud or graft.

W. B. VINING: If we have the acre orchards, what about the commercial orchards?

E. G. KELLY: I do not believe the acre orchard will destroy them. Some of the home orchards are more than an acre orchard.

A MEMBER: These acre orchards spread disease. An acre orchard can spread disease for ten miles around to all other orchards.

E. G. KELLY: Could if it had San José scale. Any orchard, whether acre orchard or not, can cause the fruit grower considerable trouble. The scale can be gotten rid of. An acre orchard should be cared for just as carefully as a commercial orchard.

A MEMBER: The man who has an acre orchard is not likely to give it proper care.

E. G. KELLY: A man who is too lazy to give the orchard the proper care should not have any. The San José scale is easily controlled. If the infested trees are destroyed we can soon control it.

A MEMBER: The Osage orange is one of the worst trees that we have to spread the scale.

HOME STORAGE.

ALVIN F. BAKER, Baldwin.

The first crop of apples that I produced in Kansas was in the fall of 1908. I had no storage house or cellar at that time and did not know what to do with the apples, as the buyers were offering only thirty cents a bushel. I could not figure any profit by accepting such a low price. From the fruit-crop reports I knew that good apples would be worth one dollar a bushel as soon as the cheaper grades were off the market. My neighbors informed me that apples could be kept in fine condition by making shallow pits and covering them with old hay, straw and dirt. I tried this method and was successful in a general way, but found that there were several serious objections. How much covering they needed was a question hard to decide. Sometimes I would put on too much covering and the apples would get too warm and

decay. Another time not enough material would be put on and the frost would get in and ruin them. This method put temptation in the way of others, and often I would find a pit broken into and several bushels of apples gone and frost entering through the broken covering. The apples sold for one dollar a bushel, as I expected, but the losses sustained were too heavy. Something better was needed, and I decided to build an apple house with a large cellar underneath. The cellar will hold 1,000 bushels and the room above almost as many. This room is not frost-proof and calls for the use of a stove quite frequently. They keep better in this room than in the cellar, but require much more care, and I always sell them first. Better ventilation, I think, is the reason that they keep so well. The cellar is just like any house cellar and has no way of ventilating except by the door and windows. Good ventilation is necessary. I always find the more spoiled apples in the far corner where it is difficult to change the air. I have had trouble in the cellar with the blue-mold rot, and when this gets started the quicker the apples are sold the better, as they decay very rapidly from the effect of this fungous disease.

Apples, to keep well, should not stand in the hot sun after they are picked, but should be placed in storage as quickly as possible. For the first ventilation, and while picking, I open the doors and windows of the house and cellar at night and keep them closed during the daytime. This cools them off and keeps them at a low temperature, thus preventing premature ripening and decay. During the winter I keep them as cool as I can without danger of freezing. The first few years that I stored apples they were very cheap in the fall and were worth much more later in the winter, and it paid well. The last three or four years a new method of selling has developed through the general use of the automobile. We now have a large trade of this kind, people coming fifty miles or more. It also makes a good market for the cheaper grades that are suitable for apple butter and other immediate uses.

My experience has been that if you can get a paying price in the fall it is much better to dispose of them at that time. By doing this one saves the loss in shrinkage, decay and added cost of handling.

DISCUSSION.

PRESIDENT HOLSINGER: The paper is before you for discussion.

W. A. S. BIRD: I would like to have some gentleman suggest the best plan of storage on the ordinary farm where a person has but few apples.

PROF. ALBERT DICKENS: The only point that I would add to Mr. Baker's discussion is the question of humidity, and we found in some common storage work that apples keep considerably better if you are careful to see that the air is sufficiently moist, and the big point I think to be emphasized is the one that was made with regard to ventilation. These fruits require some ventilation; nobody seems to know how much. It is true that in practically all of the home storage plants the apples tend to lose weight from lack of moisture, and unless the air surrounding them is sufficiently moist there is bound to be considerable loss, so that the skin will shrink and give the apple the appearance of old age long before it should have. The best common storage on earth is the spring house. Along in the spring of 1885 I was in a spring house among the Ozarks, and they had Winesap apples that were right good apples, yet even as late as early in July. It was ventilated quite

well, as all of these summer storage houses ought to be, the air coming in from below and going out at the top, which is the ideal form of ventilation. On the farm there isn't any investment that will pay better than a good storage house, concrete or stone, or any material that is available. You must keep the storage cellar shut and shut tight when the air outside is warmer than that within. If you do not there will be some sweating and you will have loss in that way. It isn't always convenient to have a thermometer, but the temperature should be watched. In October it should be possible to get the cellar cooled to the proper temperature if proper attention is given to keep shut in daytime and open at night. Another thing: You must be careful, if you have one of those floor drains, to keep out little animals. For the man who is in the business and has apples to sell, I am sure that this storage proposition, storage on the place, is well worth while.

J. B. POLKA: I have kept apples all winter in several different ways. I have a cement cave. It is ten by twenty feet, about six-inch wall, no floor, and I find if I put loose apples there along the wall they will rot more than any other place. Of course I let in the cold air during the night and close it tight in the daytime when it is warm. And I don't care if it is five or six degrees below in the winter, and now when I want to put in loose apples I just take the boxes and put them along the edges and put the loose apples inside, and they keep much better that way.

WILLIAM FREIENMUTH: I think one ought to consider first whether there is any proportion between the labor he puts into that work and the value of the product that he gets out of it. The way things are with farmers now their time is just about as valuable as anybody's, and the farmer cannot afford to put in half a day's work trying to save a couple of bushels of apples. If you have storage on the farm it ought to be arranged so that you can put apples in and take them out without much extra work. The place should be so arranged that you just simply unload them there. I have a cellar; it is on the side of a hill. You can go in on the level, and it is covered with dirt all around except in front; in front there are walls about six feet. The door is a double door and the floor is a double floor with paper between the boards, and above that is a tool house where there is no fire kept. In that cellar I can carry apples in from the wagon, and whenever I want to take them out I can go in and take out as many as I want any time. As far as the storage goes, I can keep them generally until the middle of May. Of course I do not say they keep as well as in cold storage, but there is very little loss. I sold my whole crop this way out of the cellar, and I received a good price for it.

PRESIDENT HOLSINGER: How cold can apples get before they will be injured?

A MEMBER: In the cold storage of apples I aim to keep them right around thirty degrees. They will stand twenty-six degrees for a certain length of time—probably twelve or fourteen hours won't hurt—but if they stay at twenty-six degrees for, say, thirty-six hours they would be frosted; but if left alone and not disturbed they will come out of it and not suffer any bad effects. If they are in a temperature of twenty-five or twenty-six degrees for any length of time and then the temperature is suddenly raised ten degrees, I think they break down, the partitions will break down, and while

you will not notice it right at the time, their keeping quality is injured and they will not keep so long. In cellars I believe it would be the same as in a cold-storage room, if they are left and not moved or disturbed they will be all right, but if you just touch them with your finger there will be a bruised place. You have all noticed that when apples are frozen on the tree, if you pick them, when the frost comes out you can see your finger prints—bruised. I think a great deal depends on the humidity of the room, and a number of things have to do with it. Cold-storage rooms used to be kept at 32 degrees, but it is generally conceded now that thirty degrees is really better than thirty-two.

BEEKEEPING CONDITIONS IN KANSAS.

DR. J. H. MERRILL, State Apiarist, Manhattan, Kan.

Kansas is located in the geographical center of the United States. It consists of a gradually rising slope from the Missouri valley to the foothills of the Rocky Mountains. Its climate is characterized by wide extremes in temperature, great variations in the seasonal rainfall, an abundance of sunshine, with a dry air and plenty of wind movement.

RAINFALL.

The annual rainfall in Kansas decreases from forty-two inches in the southeastern counties to a little more than fifteen inches at the Colorado line. The northern half of the state receives practically the same rainfall as the southern, except that the northeastern quarter receives a little less than the southeastern quarter. From 71 to 78 per cent of the annual rainfall comes during the six crop-growing months—April to September, inclusive—and there are no states in the country, except a few along the Gulf coast, that, taken individually, receive as much rain during the summer months as the eastern third of Kansas. The middle third receives over twenty inches of rainfall during these six months, which is within two inches of the amount that falls during the same period in Illinois, Indiana, Ohio, New York, and the New England states. The western third of the state, usually called the semiarid region, has a rainfall almost equal during these six months to that of Michigan and Wisconsin.

The altitude varies from less than 1,000 feet in the eastern portion to well above 3,000 feet in the western portion. The area included in the section below 1,000 feet lies chiefly in the southeastern part of the state and in the valleys along the Kaw and Missouri rivers. In the Kaw valley this lower area extends west from Kansas City for about 100 miles. The central portion of the state is between 1,500 and 2,000 feet. This area is fairly well defined from the north to the south. The three western tiers of counties are practically all above the 3,000-foot level.

SOILS.

The soil of Northeast Kansas, extending west for twenty or thirty miles, is the loess soil. Glacial soils extend west of this line as far as the Blue river and south of the Kaw river. Southeastern Kansas soils have been formed from shale and are not adapted to leguminous plants. West and north from the southeastern corner of the state, shale decreases and limestone becomes

more prominent in the form of soil. Throughout the central section are found most of the soils formed from a mixture of sandstone, limestone and shale, and are well adapted to clover and alfalfa. In northwestern Kansas the soils have been formed from the action of the winds, and in the southwestern corner the soil is largely due to the outwashed material from the Rocky mountains. All soils in the central and western parts of the state are high in lime, which is valuable as a plant food.

Owing to the fact that there is such a great range of altitude, soil formation and amount of precipitation in the state, there is considerable range in the honey plants. Some plants which appear in one section may be absent in another, or if they are present may produce no nectar at all. In addition to the fluctuations in the nectar yield, there is also a difference in the quality of the honey produced from the same kind of plants when grown in different sections.

In order to secure information on the honey plants of Kansas, questionnaires were submitted to a number of leading beekeepers in representative sections of the state. Information was requested in regard to each plant as to (1) the date of blooming, (2) its value for spring brood rearing, (3) whether it yielded nectar or pollen, or both, (4) the color of the honey, (5) its quality, and (6) its importance as a honey plant in that locality.

REGIONAL DIVISIONS.

Kansas may be divided into four sections as regards its honey-plant and beekeeping conditions. The annual rainfall in what may be termed the northeastern and southeastern sections is very nearly the same, ranging from thirty-three to forty-three inches. The conditions found in that section lying west of the Missouri river and south to and including the Kaw valley are different from those found in any other part of the state. Along the Missouri river is found a loess soil, and this extends west for about one-half of the district, where the soil becomes glacial. The portion of this section in which the loess soil is found is particularly adapted to fruit growing. This furnishes considerable nectar and pollen for the bees in early spring. Maple and elm are quite abundant along the river valleys in the northeast section. Soft maple furnishes both nectar and pollen, while elm is valuable for pollen for spring brood rearing. Dandelion is quite generally abundant over all of this section, and coming in bloom, as it does, soon after the maple and elms, it is a very material help in building up strong colonies. After the dandelion come the cherry, plum, peach, pear and apple, and these are followed in turn by the small fruits. White clover is of importance only in this northeast section. It is found blooming in other sections, but is not valuable as a honey plant. Even in this section it is variable.

Frank Hill, Nemaha county, reports that white clover is a good yielder in his locality, and he is not sure whether it exceeds sweet clover in value as a honey plant, yet he is certain that when it does yield it outyields sweet clover.

C. B. Baxter, of Leavenworth county, observed that white clover produces well during the year following a "wet year which follows a dry year." He further adds that although fields may be white with clover, it does not always produce nectar. The beekeepers in several of the counties in the northeast section place white clover as being the most important nectar-producing plant, with sweet clover second, while others reverse this. During the summer

of 1921 as high as 200 perfect sections of white-clover honey per colony were produced in Douglas county.

Alsike clover does well wherever it is grown in the northeast section. However, there is not enough of it planted at present, but its importance is becoming recognized more and more. Later-appearing plants which are valuable are the basswood, Spanish needle, goldenrod and heartsease. The heartsease especially is a heavy producer, enabling the bees to store enough honey in the hives for the winter. This northeast section, as has been shown, has maple, elm, dandelion and fruit bloom to help in the spring brood rearing. These are followed by white clover, sweet clover and alsike, which provide the main honey crop, and the supplies for winter are furnished by goldenrod, Spanish needle and heartsease. Although considerable alfalfa is produced in this section, it does not ordinarily produce any nectar.

THE SOUTHEAST AND CENTRAL SECTIONS.

The reports of the honey plants in the southeast section are not as complete as those of the northeast, probably due to the fact that there are fewer beekeepers in that section. The soil in this section is formed from shale and is not adapted to leguminous plants. Spanish needle is reported from two counties to be the most important honey plant, followed in importance by sweet clover, heartsease, in the western part of the section, and by persimmons in the eastern part. Goldenrod and heartsease furnish the bulk of the late honey.

The central part of the state includes that portion which lies between the 1,000-foot altitude on the east to the 2,000-foot altitude on the west. The rainfall in this section varies from twenty-one to thirty-one inches, while the soil is formed from a mixture of sandstone, limestone and shale and is well adapted to the growing of leguminous plants. The majority of the beekeepers in the state are to be found in this section. The beekeeping conditions are very favorable, especially in the river valleys, among the most important of which are the Arkansas, Kaw, Blue, Verdigris and Solomon.

In these river valleys are found maple and elm, followed by dandelion, which all help to build strong colonies for the summer's work. Considerable fruit is grown in this section, especially in the Arkansas valley. The bees have been known to store surplus honey from apple bloom. Yellow sweet clover is the first plant of importance for the main crop. In about three weeks this is followed by the white sweet clover; then comes the alfalfa. Throughout this section alfalfa is the most important honey plant found. It is closely followed in importance by sweet clover, while heartsease ranks about third and dandelion fourth. There are many plants which are of minor importance when their value to the whole section is considered.

THE WEST-END REGIONS.

The western section varies in altitude from 2,000 feet on the eastern border to over 3,000 feet on the western. The western part of the state is in the foothills of the Rockies. The soil in the northern part of this section is formed by the action of the winds, while the southern part is composed of soils washed down from the Rocky Mountains. Both sections contain a high percentage of lime.

This is what is popularly, or rather unpopularly, known as the "short-grass" region of Kansas, yet large areas are at present under irrigation and yield heavy crops of alfalfa, sweet clover, sugar beets and cantaloupes. In the

Arkansas valley the water is so near the surface that the long alfalfa roots penetrate sufficiently to reach it, and considerable alfalfa is raised in the valleys, even where there is no irrigation. In the western part of this section the Rocky Mountain bee plant, which is a very valuable honey plant, is found growing in profusion. Some of the largest apiaries in the state are located in this western section. As alfalfa and sweet clover are the two main crops, the drawback to this section is that it is deficient in spring honey plants. Consequently it is necessary to leave a large amount of honey in the hives in the fall. Owing to the fact that practically all of the honey is produced from two kinds of flowers, the quality of the honey is more nearly uniform from year to year than in any other section of the state.

NECTAR AND POLLEN SOURCES.

Alfalfa (*Medicago sativa*) blooms about June 1. Alfalfa is at present the most important honey plant found in Kansas. Of twenty-six replies received from beekeepers in various parts of the state, ten reported alfalfa as being of first importance, four placed it second, one listed it as an occasional yielder, while in eleven counties, although alfalfa was grown in some of them, it was reported as yielding no nectar.

Arthur V. Small, of Augusta, Kan., in the *American Bee Journal*, made the statement that alfalfa does not yield nectar in Kansas below the 1,000-foot altitude. At a meeting of the beekeepers held in Manhattan this statement was slightly changed by Mr. Small, so that it now reads: "Alfalfa produces nectar under proper climatic conditions, and the climatic conditions are those ordinarily found at above 1,000 feet elevation."

Considerable alfalfa is grown in the northeast section, but it is only where the climatic conditions are similar to those found in the central section that the bees are found working on this plant. The alfalfa honey is of a very fine quality, light in color, mild in taste, and as is usual with alfalfa honey, granulates very rapidly. Alfalfa honey is water-white in color at Lamar, Colo. As we go eastward we find that alfalfa honey at Garden City, Kan., is white, while at Mount Hope and the eastern part of the central section it is light amber. Although it varies in color, its quality is excellent wherever found.

White sweet clover (*Melilotus alba*) becomes of importance in June and July. It was reported of first importance in seven counties, of second importance in eleven, and not reported at all from eight counties.

Although alfalfa is at present rated as more valuable than sweet clover as a honey plant, it probably will not long hold this position, due to two reasons: (1) Because sweet clover yields nectar wherever it is found in Kansas; (2) because the acreage devoted to the raising of sweet clover is being rapidly increased owing to recognition as to its value for a soil builder and a forage crop. The honey produced from sweet clover is very light in color and does not change color in different parts of the state. It is very mild to the taste, and, like alfalfa, granulates rapidly.

Yellow sweet clover (*Melilotus officinalis*) blooms two or three weeks earlier than the white sweet clover, and is especially valuable on account of this fact, because it blooms at a time when practically no other honey plants are in bloom. The amount of yellow sweet clover is being increased from year to year.

White clover (*Trifolium repens*) blooms the last of May and the first of June. This is of value as a honey plant only in the northeast section, while it is found on the lawns as far west as Finney and Kearny counties. The high yields which are reported from this flower indicate that it is very valuable where it does produce nectar. Where the white-clover yield is heavy it is possible to produce comb honey in paying quantities. The honey from this plant has the usual high quality that is found in white clover elsewhere.

Heartsease (*Polygonum* sp.) blooms from August until frost. This plant is quite generally found over the northeast, southeast and central sections, but it is not of importance in the western section. It is usually a very heavy yielder unless it is cut short by a very heavy frost. Heartsease honey in those sections of the state where alfalfa produces nectar is dark, very strong and not at all pleasant to most tastes. In those sections of the state where alfalfa produces no honey the heartsease is lighter in color, milder and better flavored. This is undoubtedly due to the fact that in those sections where alfalfa yields nectar the variety of heartsease which produces dark, strong honey predominates, while in other sections of the state the heartsease honey is obtained mostly from another species of this plant.

Alsike clover (*Trifolium hybridum*) blooms in July. This plant does well in the northeast section of the state, where the rainfall is too great for alfalfa to produce nectar. It does well, and could, and probably will, be planted more generally in the future.

Dandelion (*Taraxacum officinale*) begins to bloom the first week in April. It is found mostly in the northeast and east part of the central sections. This plant is of great value in spring brood rearing. The honey produced from it is wholly consumed for this purpose.

Basswood (*Tilia americana*) blooms the middle of June. This tree is found in some of the river valleys in the northeast section and is valuable, but its distribution is very limited.

Goldenrod (*Solidago*) blooms from August until frost. While several varieties of goldenrod are found in Kansas, it is reported of importance from a few of the counties in the southeastern section.

Spanish needle (*Bidens*) blooms the middle of August and is a very important honey plant along the entire eastern border of the state of Kansas.

Fruit bloom—cherry, plum, peach, pear and apple—is valuable in the northeast section and in the river valleys in the central section. These trees come into bloom early in the spring. They produce both pollen and nectar and are of great value in spring brood rearing. In apiaries which are located near some of the large orchards considerable surplus honey has been stored during the apple-blooming period.

Soft maple (*Acer saccharinum*) blooms in February and March and is one of the first sources from which the bees may obtain both nectar and pollen. The soft maple is found quite generally over the northeastern and central sections of Kansas.

Elm (*Ulmus*) blooms in February and March. Very valuable for spring brood rearing, as it produces large quantities of pollen. This tree also is quite generally found in the northeast and central sections of the state.

Box elder (*Acer negundo*) blooms in April and May. It is very generally found over the state and produces both pollen and nectar.

In addition to the above-named honey-producing plants, there are quite a few others, which, although important in the locality in which they are grown, are not extensively enough grown to be of importance over the whole state. Among these are:

Persimmon (*Diospyros*) blooms in June, reported of importance only in Cherokee, the southeast county of the state.

Aster (*Aster*) blooms from August until frost. Scarce and unimportant.

Black locust (*Robinia pseudacacia*) blooms in May. Valuable in river valleys.

Cantaloupes (*Cucumis melo*) bloom in June and July. Of importance in western Kansas.

Sumac (*Rhus*) blooms in July. Important in the northeast and central sections of the state, producing a good quality of light honey.

Horsemint grows in abundance in the Arkansas valley in the vicinity of Hutchinson and extends west as far as Larned. On the south of the river it is found on the upland where the soil is of a sandy or gravelly nature, which is the only type of soil on which it is found in that vicinity. The time of blooming is the 15th of May to the 1st or 6th of June. This bloom is sometimes cut short by dry weather. The most favorable condition is plenty of moisture while growing, then hot weather with light showers. In the last ten years this has yielded four good crops of honey, averaging from ten to fifteen pounds per colony. The honey produced from this plant is very light amber, light in body, and has the pronounced mint flavor, which is so strong that it cannot be classed as a number one honey. However, when blended with the milder honeys it is very much in demand. The plant has no value as pasture, for stock will not eat it, consequently it is considered as a pest.

BEEKEEPING IN THE STATE.

In the northeast section, owing to the abundance of spring flowers which produce both pollen and nectar, it is possible to build up strong colonies ready to take part in the summer honey flow. This section of the state is particularly adapted to the raising of comb honey, as the flows from white clover and heartsease are usually very intense. There are some very good beekeepers in the northeast section, but there is still room for others. There are probably more beekeepers in the central section of the state than in any of the other four, and while it is possible to produce comb honey in paying quantities, yet, as the honey flows are long and not so intense, this section is better adapted for the production of extracted honey.

In the western section of the state the honey flow from alfalfa is long and at times very intense, making it profitable to produce either comb or extracted honey. As there is a dearth of spring plants in this section, beekeeping practices have to be modified somewhat so as to leave plenty of pollen and honey in the hive in the fall to last the bees until spring.

Kansas has several beekeeping societies, the most important of which are the Kansas State Beekeepers' Association, the Eastern Beekeepers' Association, and the Arkansas Valley Beekeepers' Association. It also has the Kansas Honey Producers' League, which organization is a member of the American Honey Producers' League.

The interest shown in better beekeeping is becoming greater and greater,

and as Kansas has so many natural facilities for beekeeping, the outlook for the future of this industry is very bright. We have a map of the plants of the state that we would be glad to furnish to anyone.

DISCUSSION.

B. H. GRAGG: In what section of the state did you locate us—northeast?

DR. J. H. MERRILL: Yes; northeast.

A MEMBER: What about buckwheat as a bee food?

DOCTOR MERRILL: Not important as a honey plant in Kansas.

A MEMBER: I was counting on planting some and using it as bee food. I do not like to give up my plan.

DOCTOR MERRILL: It has not proven very successful in Kansas.

A MEMBER: Is the alsike equal to the white clover?

DOCTOR MERRILL: Good, but not enough grown.

B. H. GRAGG: Is there any annual we plant that is good as a honey flower?

DOCTOR MERRILL: Yes; the annual sweet clover.

A MEMBER: Is the Hubam clover as good as the white sweet clover?

DOCTOR MERRILL: Yes; and it is one year ahead of the biennial sweet clover.

B. H. GRAGG: How long after you plant sweet clover before it yields nectar?

DOCTOR MERRILL: It is a biennial. I have had some very good reports from it.

A MEMBER: Is the yellow clover a biennial?

DOCTOR MERRILL: Yes; the yellow clover is tremendously important, because it blossoms two or three weeks ahead of the white. The bees may build up a good, strong colony. Unless they have something like this with which to build up the colony the queen soon stops producing eggs. If the yellow clover blossoms before the white and the bees have it so they can get to it, the queen will go on depositing eggs and the colony is in fine shape.

B. H. GRAGG: Has the red clover any value?

DOCTOR MERRILL: Yes, if the bees could get at it, but their proboscis is too short. The red clover is fine for the bumblebee.

A MEMBER: Which is the best variety of bees?

DOCTOR MERRILL: Italian bees; the three-banded Italian preferably. There is the Golden Italian or five-banded, but the three-banded is more stable than the Golden.

W. B. VINING: Is it possible for the bee moth to destroy a strong colony of bees?

DOCTOR MERRILL: Moth will not destroy a good, strong colony of bees, especially the Italian, because they are stronger than most any other variety. The moth may destroy a weak colony through a run-down condition of the queen. In many cases we find that the weak colony has been decimated by disease.

A MEMBER: What about foul brood?

DOCTOR MERRILL: American or European?

A MEMBER: Both.

DOCTOR MERRILL: American foul brood is spread by affected honey. The bees feed the larva on the affected honey. The only way to get rid of it is to move the colony into a new hive with full sheet foundation, and be sure

that it does not carry with it any of the affected honey from the old hive. The best way would be to take the colony to a new hive and either destroy the old one or be sure that it is absolutely cleaned. Of course the old comb must be destroyed, and while the honey can be used for human food it must be kept where bees cannot possibly have a chance to feed on it. Destroy all cartons and containers or see that they are absolutely cleaned of all honey.

A MEMBER: Which is there most of?

DOCTOR MERRILL: If you have a colony and it becomes affected with European foul brood, build up the colony. If you have ten colonies, put them into one and change the queen. Get an Italian queen. Italian bees are not immune to foul brood, but are very resistant.

JAMES SHARPE: Is it possible for a colony to overcome foul brood?

DOCTOR MERRILL: Yes; build up the colony into a strong one. Italian bees will overcome European but not American foul brood.

A MEMBER: What is the Colorado honey plant?

DOCTOR MERRILL: It is a plant that grows about four or five feet high, looks like an aster; quite a pretty blossom.

A MEMBER: Has it a name?

DOCTOR MERRILL: Rocky Mountain bee plant is the only name that I know. When we were coming back from Colorado we stopped at Rocky Ford and bought some cantaloupes. After we had eaten them the boys threw the rinds over into a clump of the Rocky Mountain bee plant and the bees rose up out of the clump like a cloud, a swarm of them.

BEEKEEPING IN KANSAS.

[DR. J. H. MERRILL, assistant professor of entomology at Kansas State Agricultural College, Manhattan, who is also state apiarist, has prepared the following papers, which are of much interest to those who keep bees.]

RACES OF BEES IN KANSAS.

There are several races of bees found in Kansas. They are principally the Black or German bees, Caucasians, Carniolans, Italians, Goldens, and last but not least, the hybrids. Each one of these different races has individual characteristics, some good and some bad. With some of the races the bad points overbalance the good, thus making that race unsuitable for honey production in our state.

The Black (or German) bee has probably been in this country longer than any of the other races. It is commonly spoken of as the native bee, although this is not true, as honeybees are not natives of this country. They were introduced into New England in 1638, and on account of their long stay here have come to be known as native bees. In spite of having been here for so long, they are not particularly well adapted to this country. They are less prolific than the Italian bees, are very cross, build a great many queen cells, and therefore swarm often. They are not very good at cleaning their hives or resisting moths. They are not resistant to European foul brood, which is one of the worst brood diseases of bees. They are very excitable, and run wildly about on the combs when the hive is opened. This, together with the fact that the queen is not marked differently from the workers,

makes it very difficult to locate her on the frame. Their good points, however, are that they cap their honey white, making a very fine-looking product, and are said to stand the winter well. The fact that they have been here since 1638 would seem to bear out this point.

The Caucasian bee varies in color, but closely resembles the black bee. It is said that some of them show yellow bands on the abdomen somewhat similar to the Italians, but most of them are dark gray with a metallic blue cast in the drones. This race of bees has a great many good points. They have not been in this country very long and have not been tested as thoroughly as the black bees. They were introduced into New York in the year 1880. They are the gentlest race of bees known. They cap their honey white, are good workers, defend their hives well against robbers, winter well, and, generally speaking, are very desirable bees. The disadvantage of this race of bees is that they use an abundance of propolis in their hives, sometimes almost closing entire entrances. In addition to their habit of propolizing the hive, they use burr and brace combs lavishly. As they closely resemble the black bees in color, it is very hard to tell when they are purely mated, and hybrids from this race are not as gentle as the pure bees. A great many beekeepers are loud in their praise of the Caucasian race, and it may come to find a more prominent place than it now occupies.

The Carniolans, like the Caucasians, are very gentle bees; and like them also, they have not been tested here long enough for us to know just how valuable they are. These bees are dark colored, and when seen in a group appear to have a bluish color. However, when examined closely this bluish color is accounted for by the fact that the wings are iridescent. The body of the Carniolans is more definitely gray than the Caucasians. These bees are very prolific, the queen continuing to lay even after the honey flow has ceased. On account of their prolificness they swarm excessively. They are very good workers, cap their honey white, and pass the winter well. They do not run about on the combs when the hive is opened as do the black bees. The most serious facts against them are that they swarm excessively and that they resemble the black bee so closely that it is hard to tell when the matings are pure.

The most popular and most successful race of bees in this country is the Italian. They combine a great many of the good points of the other races, while many of the faults of the others are lacking to a very large extent in this popular race of bees. The typical color is for the abdomen to be marked with three transverse yellow bands, and are usually spoken of as being leather-colored Italians. The workers are the best indication as to the purity of the race, as the drones and queens are apt to vary a great deal in their color markings. The Italian bees do not cap their honey as white as do the three first-named bees, nor are they as prolific as the Caucasians and the Carniolans, but they are much more so than the German bees. They are ordinarily gentle, but even in this respect they do not equal the Caucasians or Carniolans. However, they are good workers. They defend their hives against robbers and against moths. They are very resistant to European foul brood. In fact, whenever this disease occurs the treatment recommended is to replace the queen in the diseased colony with an Italian queen. The Italian queen will cease brood rearing when there is a dearth

of nectar, which fact is often valuable, as she will stop producing bees that will not take part in any of the work, but merely be consumers. The fact that these bees winter well, are of such a good disposition, protect their hives from enemies, and especially that they are resistant to foul brood, makes them the most satisfactory race of bees that we have in this country, and the ones to be recommended generally.

The Goldens are Italian bees, which are distinguished by having five bright yellow bands on the abdomen instead of three. These bees have a great many characteristics of the regular Italian, and resemble them so closely that it would be hard to distinguish them from the characteristics of the regular three-banded Italian bees. Reports as to their value vary, some reporting that they have exceptionally good results from the use of these bees, while some claim that their disposition is not pleasant and that they are not good workers. Until these bees have been more thoroughly tested it will be well to use the standard three-banded Italian bees.

The so-called hybrid bee may be a cross between any two races, but in this country it usually refers to a cross of the black and the Italian. It is the one most commonly found in the timber, box hives, or other places where the strain has been allowed to deteriorate. These are very variable in characters, but mostly they combine a few bad traits of the others, and then add a few more bad ones of their own.

The fortunate thing about beekeeping is that the race of bees in any colony can be changed in a short time by killing the original queen and introducing another of the desired race. Before long, then, the colony will be of the same race as the new queen.

PLANT CROPS FOR THE BENEFIT OF THE BEES.

When the owner of a cow wishes to provide sufficient pasturage for this animal he can estimate the amount of land that will be required to raise the amount of food necessary to provide that cow with nourishment throughout the season. Having made this estimate, he can then plant whatever crop he decides, put a fence around the pasture, and everything has been provided for in the line of food. The fence will keep the cow in the pasture, and at the same time will prevent other animals from getting in and taking that which was not originally intended for them. However, in the case of providing pasturage for bees the question is not so easily solved, for several reasons. First, it would be impossible to estimate the exact amount of acreage which should be planted in order to provide enough food for any given number of bees; second, bees are no respecters of fences, and not only would the bees for which the pasturage was intended avail themselves of the opportunity of feeding there, but it would be equally open to all other bees in the community. In other words, it would not pay to plant crops with the sole idea in mind of their serving as sources for honey. It would be much better in locating an apiary to select, if possible, a location which is already provided with plants which furnish both nectar and pollen, for it must be borne in mind that not only nectar-producing plants are necessary, but we must also have pollen-producing plants. In choosing this location one should be careful to see that there is a continuation of food supply throughout the summer. If

there are only one or two honey plants which furnish nectar in any great amount it might be that the period between the flows of honey would be so long and the honey flows might be so short that the bees would consume during the period of drought all of the honey which they stored during the honey flow. It is always possible, however, to improve any location in the matter of honey plants, and probably the best way to do this would be to join with the farmers in that community and encourage them to plant forage-crop plants that will at the same time furnish nectar. Prominent among this class of plants would be alfalfa, clover, sweet clover, alsike and buckwheat, because plants should serve a dual purpose of being both forage and honey plants. The beekeeper who would contribute toward the purchase of seed to encourage his neighbors in the planting of these dual-purpose crops would be well paid for his investment.

Some of the sources of honey which particularly apply to Kansas are, in the early spring, the elm trees, which furnish pollen, while the soft maples furnish both nectar and pollen. These are followed by the dandelion, which is one of the most valuable plants from the beekeepers' standpoint that we have, because it blooms so early in the spring and furnishes an abundance of pollen, which is so necessary for brood rearing. The fruit bloom in those sections of the state where fruit is produced furnishes nectar for brood rearing. Most of the nectar furnished by this class of flowers is consumed in rearing brood, and it is rare that any surplus is stored from this source. After the fruit bloom comes the white clover bloom in those parts of the state where clover is found. This is a very valuable source of nectar, and it is at this time that the beekeeper should put on his supers, so as to allow the bees to store the large surplus which they should gather from white clover. Of the sweet clovers, the yellow sweet clover blooms about three weeks earlier than the white sweet clover, and in a great many parts of the state there is a dearth of bloom between the time of the appearing of the fruit bloom and the white sweet-clover bloom. Those sections, however, where the yellow sweet clover is found do not suffer from this dearth. Consequently, beekeepers should urge and assist in seeing that all the waste places in their neighborhood are sowed to yellow sweet clover seed. It is possible to purchase this seed individually, or, better still, to secure the seed through your local beekeepers' association; then at the meeting of the association plans can be made for sowing different portions of the country, that the seed may be wisely distributed. The white sweet clover which is found so plentiful along the roadsides and waste places throughout the state is valuable, if not the most valuable honey plant that we have. As white sweet clover has proved to be a valuable forage plant, everything possible should be done to encourage its wider and more abundant distribution. Alfalfa does not produce honey everywhere that it is grown. In the drier sections of the country, and especially irrigated portions, it is an abundant producer of nectar. However, in the more humid sections it does not yield any nectar. Wherever alfalfa will not yield nectar, alsike clover should be grown and will be found valuable both as a forage plant and as a nectar-producing plant. Corn, although it probably does not produce any nectar, is very valuable as a pollen-producing plant.

The foregoing plants are the ones from which our chief source of light honey is produced. In the fall of the year heartsease, asters and other fall-

blooming plants usually produce an abundance of nectar. The amount that will be secured from a fall flow cannot be securely counted on because of the danger of an early frost. The heartsease honey varies in color in various parts of the country. In some places it is light, while in other places it is very dark. Heartsease does not need to be planted, neither do asters, as they will appear themselves in sufficiently large quantities to be of use if the season is at all favorable.

It has been estimated that in order to produce one pound of honey it is necessary for a bee to make several hundred thousand trips to the field. This, of course, means that a large number of plants must be visited in order to bring in a single pound of honey, and it will be seen that it would not be profitable to sow crops solely for the nectar which they would produce. However, as stated above, if the nectar-producing plants can also be used as forage crops, then they will be useful to both the stockman and the beekeeper.

MAKING MILK OUT OF HONEY.

What would be thought of a cow that could be bought for \$40 which would provide two quarts of milk daily and two quarts extra for every Sunday in the year? In addition to providing this milk, it must be put into glass jars and delivered at the door. I do not own such a cow, nor do I believe anyone else does. However, I do own four colonies of bees valued at \$40, which produced enough honey to purchase the amount of milk above named. The comparison might be carried still further and mention made of the fact that the bees went to pasture and returned unattended; there was no pasture rent to pay for them, and instead of it being necessary to purchase expensive grain for their winter feed, they brought home and put away enough food themselves to last them all winter, besides storing a surplus for my benefit. A man may capture a stray swarm of bees, put them in a hive, and call them his own, but he could not do the same with stray cattle and still be a law-abiding citizen.

These four colonies of bees had nothing to boast of in the line of ancestors. In fact, two of them were stray swarms which were caught and hived, while the other two were purchased at \$6.50 per colony. The fact that I valued them at \$10 per colony in the spring is not because they had cost me that much, but because that would probably have been the selling price at that time.

Early in August all four of the old queens were removed and young, untested queens—so called because they were so young their progeny had never been tested as to the purity of their race—were introduced. The reason for requeening at this time of the year was because the two queens in the purchased colonies were of uncertain age, while I knew that the queens in the colonies which were caught as swarms must have been old queens, as it is always the old queen that leaves with a swarm. Consequently I wanted to have queens all of the same age, and August was the most desirable time of the year to do this requeening. A young queen introduced into a colony at this time would insure a large number of young bees before the colony went into winter quarters. No honey was removed from these colonies during the first year, as the honey flow that year was not particularly heavy and I wanted to be sure that each colony of bees had enough honey left them to

last until the next honey flow began. Accordingly, forty to forty-five pounds of stores were left in each hive for the bees to consume during the winter.

When choosing a location for my bees I selected the south side of a dense hedge windbreak, as I considered such a windbreak would be better than a solid board fence. Immediately after the first frost I began to pack them for the winter. The reason for putting on the packing was because bees are like storage batteries, having just so much energy to expend, after which they die. During the winter the bees form a hollow cluster in the hive as soon as the temperature falls to 57 degrees. On the inside of this cluster will be found a number of bees fanning the air and performing other muscular exertions so as to raise the temperature of the hive. From time to time they go to the outside of the cluster and other bees come in and take up the work of maintaining the high temperature. The more of this work they have to do the quicker they wear out. The young bees which I secured in such large numbers by introducing young queens in August had the advantage over old bees in that they had enough energy to maintain the proper temperature of the hive and still be able to take part in the heavy work of spring brood rearing. The reason for the insulation was to help the bees retain this desired temperature with a minimum expenditure of energy. The hives were placed on hive stands about seven inches high, which had been previously packed with leaves. As this was a good, strong colony of bees and I wanted them to have plenty of room for spring brood rearing, two hive bodies were provided for each colony. On top of each upper hive body a queen excluder was placed, and on this a super with burlap tacked over the bottom. This super was then filled with dry forest leaves. Next a two-foot poultry netting with two-inch mesh was placed around the hive, which extended out eight inches from it, and leaves were pushed down between the poultry netting and the hive and packed in firmly. Of course I left an opening in the front for the bees to come out whenever they desired to take a flight. After these preparations were finished I felt quite satisfied and had no fears as to whether my bees would successfully winter. I knew there was an abundance of bees in each hive and that each had forty to forty-five pounds of stores left, that they were wintered in two stories, so they had plenty of room for spring brood rearing, and that they were protected not only by being well packed but by being placed in the shelter of a dense windbreak.

Having taken all of these precautions in the fall, the question of spring management of my bees was reduced to a minimum. I knew they had honey enough and room enough, and I could tell from the number of young bees flying in front of the hives that each one must have a queen, consequently I was able to postpone the first examination until very late in the spring, thus eliminating a lot of needless and really harmful manipulation.

Just before the honey flow began these colonies were examined carefully and several frames of brood were found in each colony. As young bees were emerging very rapidly, they were beginning to crowd the brood chambers, thus bringing about a condition which would ordinarily cause swarming. In order to prevent this the queen was located in each colony, placed on one frame of brood, and confined to the lower brood chamber by a queen excluder. The rest of the brood was placed in the upper story above the excluder. The queen was now confined to the lower story with only one frame of brood and

had plenty of room for egg laying. The fact that the brood chamber was no longer crowded by young bees stimulated the field bees to become more active. When the weather became warm the hives were blocked up so that they might be more easily ventilated, which also had a tendency to prevent swarming. As the queens were very vigorous and filled the frames in the brood chamber with brood, it was necessary to repeat this plan of separating the queen from the brood several times during the summer. Our main honey flow in the vicinity of Manhattan comes from alfalfa and sweet clover, and the honey from these two sources is light in color, good in quality and commands a good price. During the fall heartsease blooms abundantly. Heartsease honey is a very satisfactory honey for the bees to pass the winter on, but in this locality it is dark colored and strong to the taste; consequently it will not bring as good a price as either alfalfa or sweet-clover honey. During the summer I removed the alfalfa and sweet-clover honey and sold it, and left the bees all of the heartsease honey which they had stored. The total crop from these four colonies of bees was over 400 pounds, which sold for \$125. This sum of money invested in milk at 15 cents a quart would purchase the amount of milk mentioned in the opening paragraph.

SPRING CARE OF BEES.

The proper time to begin preparing for the spring care of bees is in August of the preceding year, because it is then that a new queen should be introduced in order to insure a large number of young bees to successfully pass the winter. Young bees are able to undergo the hardships of winter and still retain enough energy to carry on the heavy duties of spring brood rearing.

During the month of September, or just after the first frost, it is the duty of the beekeeper to see that the bees have plenty of stores. By plenty of stores is not meant only sufficient food to carry them through until the elms and maples bloom in the spring, but enough to last until the honey flow begins. This means, for Kansas, about forty pounds of honey to each colony. It may be objected here that it is too late now to do these things. This is very true, but now is a very good time to call attention to the fact that the spring care of bees would have been much simplified had these things been attended to last year, and in planning next year's work these things should be done.

Those who have not followed the above suggestions should examine their colonies on the first warm day, with two purposes in mind: first, to see if they are queenless; and second, to ascertain the amount of stores in the hive. If the colony is queenless it would be better to unite it with a queen-right colony, because, although it is possible to purchase queens from the South at this time of the year, their delivery is apt to be delayed, and the colony grow weaker while you are waiting for the queens. If the stores are found to be insufficient, then a thick syrup made of two parts of sugar to one part of water, by measure, should be fed to the bees.

Great quantities of food are necessary during brood rearing, and not only food, but water; therefore, watering places should be provided near every bee yard. These are of many patterns, the chief requisite being that the bees get water from them without drowning. A tub or vessel filled with water, with

a lot of chips or pieces of broken cork floating on the surface will make a suitable drinking place.

If some of the colonies are found to be weak, even though they may have a queen, it will be best to unite the weak colonies, but always combine a weak one with a stronger one. It is practically impossible for the weak colony to become strong in time to materially assist in the gathering of the honey crop. However, if the weak colony is added to the strong colony it will increase the honey-gathering force of the latter that it may increase the surplus yield. Later, after the honey flow is over, the colonies may be divided if you wish to keep the same number of colonies that you had in the spring. Those who have had plenty of stores in their hives and were sure that their queens were good in the fall, and have their bees packed well for the winter, need be in no hurry to remove the packing, provided they have left sufficient room for spring brood rearing, because the packing material will protect the colonies during the cold nights which are apt to come between now and the beginning of the honey flow.

THE NECESSITY OF WINTER PROTECTION FOR BEES.

In order to obtain large crops of honey it is necessary to have large colonies ready to go to the field at the beginning of the nectar flow. It is essential in order to secure those large colonies that they pass through the winter with as little loss in their working force as possible. Bees, like storage batteries, have a certain amount of energy, which when once expended means the death of the bees. In order to have a large working force in the spring all precautions should be taken that will enable the bees to pass through the winter with a minimum expenditure of energy. This energy is used by the bees in the winter in maintaining the proper temperature in the hive. As bees are cold-blooded insects and do not give off heat, they maintain the proper temperature by consuming honey and by muscular exertions. Both of these processes consume energy and shorten the life of the bees.

Winter protection reduces the work necessary to maintain the proper temperature, and therefore will result in a larger colony of bees in the spring, which will possess a much more unexpended energy to carry on the spring work of brood rearing, that there may be a large working force ready for the nectar flow when it starts.

In order to ascertain whether or not winter protection is valuable, experiments have been carried on at the Kansas State Agricultural College in which two sets of three hives each are used. One set of these hives is placed out in the open where it is not protected by any windbreak, while the other set is protected by a dense windbreak of shrubbery. In each set of the three hives, each hive is wintered under different conditions. There is one one-story hive, one two-story hive, and one packed hive in each set. All of these hives are placed on scales and daily readings are taken of the change in weights. In the fall of the year when the bees are placed in winter quarters the amount of honey in each hive is ascertained, also the exact weight of the bees in each hive. As the number of bees in a pound is variously estimated at about 5,000, for the purpose of this experiment this will be the number used. As the number of bees in the hive ready for work on the day that the nectar flow

starts is a good test of how they have wintered, the weight of the bees is again taken in the spring of the year on the date when the nectar flow begins. As a result of these weighings it was found that the one-story hive which was unprotected had in the spring 11,718 bees, while the two-story hive, under similar conditions, had 16,406, and the packed hive had 36,718, or 25,000 more bees than were in the one-story hive. As bees are now selling for \$2.50 a pound, this would make a difference of \$12.50 between the packed hive and the unpacked hive. The same was found to be true in those bees which were protected by a windbreak. The one-story hive had 14,063 bees, while the two-story hive had 20,936 and the packed hive had 36,594. A comparison of the number of bees in the hives protected by the windbreak and those not protected shows a difference of about 2,500 bees in the one-story hive and over 4,000 in the two-story hive, which gives a very good indication of the value of a windbreak over no windbreak. In the packed hive the value of the windbreak is not as striking as that in the unpacked hive, which was reasonably to be expected. A theory which has long been held and frequently preached in Kansas is that there is no need of winter protection in this state, because we have open winters. The winter of 1917-'18 was called a severe winter, while that of 1918-'19 was known as an open winter. The following facts will show very clearly that this theory of not needing packing on account of an open winter is a myth and a dangerous one at that, as the open winter is much more severe on bees than a severe winter. A comparison between the number of bees in the hives in the spring with the number in the fall shows that in 1917-'18, which was a severe winter, there were 332 less bees in the one-story hive which was not protected by the windbreak, while in the hive similarly placed during the open winter of 1918-'19 there were 3,282, or about ten times as many. In 1917-'18 the two-story hive without a windbreak gained 2,806 bees, while in the open winter there were 469 less bees in the spring than in the fall. In those hives protected by a windbreak the one-story hive in the winter of 1917-'18 gained 4,538, and only 313 during the open winter. The two-story hive protected by the windbreak gained 13,346 during the severe winter, while a hive similarly placed gained only 5,936 during the open winter.

The figures given above show very conclusively three things: First, that a windbreak is of great value in properly protecting bees for the winter; second, that the open winter causes a greater loss in the bees than does a severe winter; and third, it shows above all things that packing is most essential to good wintering conditions, and proves clearly that winter protection is necessary in order to have a strong colony of bees ready for the nectar flow in the spring.

METHODS FOR WINTERING BEES.

There are several essentials to good wintering, among which the most important are: First, to have plenty of young bees in the hive in the fall of the year; second, to have plenty of stores; third, to have the bees protected by a good windbreak; fourth, to have the hive well packed with an insulating material; and fifth, to have plenty of room for spring brood rearing. If these essentials are attended to the colony should winter in good shape to be ready to take an active part in spring brood rearing, and to insure a good, strong

colony of bees to take advantage of the nectar flow when it starts. The necessity of having a large number of bees is that they will be able to maintain the proper temperature of the hive by muscular exertion during the winter and yet have enough energy in the spring to take up the spring duties in the colony. In order to have a large number of young bees in the hive, one of the best ways to be certain of this is to requeen during the month of August with a young queen. Such a queen will be more apt to raise a lot of young bees than an older queen, and another thing in her favor is that she will be less likely to swarm during the following season.

The proper amount of stores per colony for Kansas is about thirty-five to forty pounds. Sufficient stores should be left to feed the colony until the nectar flow actually starts in the spring. It is not enough just to leave sufficient honey to feed them until the maples and elms bloom in the spring, because this time is very apt to be followed by a period of bad weather or a dearth in honey, and although a colony may be strong at this time, a shortage of stores may cause their death before the real nectar flow begins. If at the time of putting colonies into winter they do not have a sufficient amount of stores they should be fed sugar syrup made at the rate of two parts of sugar to one of water, by measure. Enough of this sugar syrup should be fed to bring their stores to the required amount.

For a protection from the wind a good hedge or some shrubs will furnish the ideal conditions. A solid windbreak is to be avoided at all times. If the bees are placed near a solid board fence or a solid board windbreak, better results will be obtained if every other board is removed. When a solid windbreak is used a current of air passes over its top and then down directly to the hive.

The single-walled hives which are commonly used do not give sufficient protection from the cold, and these should be packed with some insulating material. A hive may be placed singly in a packing box, or they may be put in groups of four, with two of the entrances facing to the east and two to the west. Four inches of packing should be placed beneath the hives, six inches on the sides, and eight inches on the top. Tunnels should be made to the exterior so that the bees can pass out for flight. Packing should be put on after the first frost, and a good insulating material will be ground cork, leaves, chaff, shavings or sawdust, packed tightly around the hives. Another method of packing is to place poultry netting with two-inch mesh around the hive, allowing it to protrude about six inches all the way round, and pack between this and the hives with leaves. More leaves should be stuffed beneath the hive, and a super filled with leaves placed on top. This last form of packing gives good winter protection, is easy to prepare, and costs but little.

Plenty of room for spring brood rearing may be given by using a two-story hive for wintering purposes, as the queen will then have much more room than if confined to a single story. However, two-story hives are not always satisfactory, and it really would be better to winter bees in one of the larger hives, such as the Dadant hive or the Jumbo hive, because instead of having a break between the upper and lower hive bodies there would be one continuous sheet of comb between the bottom bar and the top bar, which would give more ideal conditions for brood rearing than if the queen were obliged to pass over the obstructions which would be found in going from one

hive to the other. She would pass up from the lower hive body to the upper much quicker than she would go back down. The obstructions in the way of her passing would act as a natural queen excluder.

To sum up, a young queen should be introduced in August to insure plenty of young bees, then winter packing should be applied immediately after the first killing frost, and if the hives are so placed that they are protected from the wind, with plenty of stores and plenty of room for spring brood rearing, there is no reason why large colonies of bees should not result from this practice. In order to get more honey from a colony we must have more bees in it, and every effort of the beekeeper which produces more bees at the right time means more money in his pocket.

THE IMPORTANCE OF WINTER STORES.

The Kansas State Agricultural College is conducting at the Experiment Station a test to determine the best form of a winter protection for bees.

The value of a windbreak, the superiority of a two-story over a one-story hive for wintering and the value of packing are clearly shown. During the winter of 1919-'20 this experiment was continued, and when on the 19th of May the bees were weighed to determine which form of wintering had been best for them, some additional factors were found to have entered into the experiment that were not present in the first two years' work. These bees were placed in winter quarters on October 4, 1919, with a known amount of honey and a known number of bees in each hive. Sufficient stores were left in each colony to feed them through any ordinary winter and to the beginning of the nectar flow. On the 5th of April the temperature at Manhattan dropped to five degrees above zero. This low temperature was accompanied by a heavy snowstorm. As a consequence of this unseasonable weather the flowers on which the bees would ordinarily depend for spring food were killed, consequently they were forced to exist on the stores which were left in the hives in the fall. One colony between October 4 and May 19 consumed 52½ pounds of honey, after which it was fed two half-filled frames of honey and six pounds of sugar. This will explain why some of the colonies became short on stores before they were weighed in the spring.

During the winter daily weights were taken and recorded. On the 19th of May, 1920, the number of bees, the amount of brood and the amount of honey were again determined. This date is two weeks later than the one on which the bees were weighed in 1918-'19, and each colony should have shown several thousand more bees this year on the 19th of May than it did last year on the 4th of May. In 1918-'19 the one-story unpacked hive in the windbreak gained 313 bees, while the packed hive in the windbreak gained 24,844; but during 1919-'20 the one-story unpacked hive in the windbreak gained 10,000, while the packed hive, similarly placed, gained only 3,700. In 1918-'19 the two-story hive in the windbreak gained 5,936, whereas in 1920 it gained 8,125. These results would seem to overthrow any evidence that we may have had in the past as to the value of winter protection, especially when we consider the fact that the packed hive in 1918-'19 had 24,331 more bees than the unpacked hive, while in 1919-'20 it had 6,300 less. This would seem to indicate that the packing had not been of any great value to it, especially when the unpacked one-story hive had five frames of brood, while

the packed hive had only three frames. Had it not been for the fact that daily records of the changes of weights were kept, those results would have been very disconcerting, and extremely hard to account for, but upon turning to the daily record we found that on April 20 the packed hive reached its lowest weight. From then until the 19th of May the gains and losses ranged from nothing up to an eighth of a pound, showing that on April 20 the winter stores were exhausted in that colony, and from that time forward they were barely able to secure enough nectar from the field to even maintain the existence of the colony. On the 19th of May, when the colony was weighed, no honey at all was found in the packed hive, while in the one-story unpacked hive there remained three and one-half pounds of unconsumed stores. The unpacked hive had five frames of brood, whereas the packed hive had only about three. To all ordinary appearances the packed hive was a good, strong colony of bees on the 19th of May, and anyone would have been justified in thinking that it had wintered well. However, when the fact is taken into consideration that during the previous year this colony gained 24,844 bees between the fall and spring, and this year only gained 3,700, we can see that something was radically wrong. As the one-story unpacked hive contained five frames of brood, while the packed hive only had three frames, we can understand why this weakened condition was brought about. On the 19th of April, when the stores were exhausted, the queen in the packed hive did not lay as many eggs as the one in the unpacked hive. To all appearances this colony had wintered well, yet when we consider that the date of weighing was two weeks later than the previous year, and that during these two weeks the queen should have deposited from 30,000 to 40,000 eggs, which would have filled six to eight frames of brood, when as a matter of fact it only had three frames, it showed plainly that the queen was seriously affected by the shortage of stores. Had we not the daily records of the changes in weights in these colonies we would never have known why this colony did so poorly. Although in this article I have spoken of one colony, the same fact holds true for the rest of the colonies which became low in stores.

When the one-story unpacked hive in the windbreak is compared with the one-story unpacked hive in the open, the odds in the number of bees gained and in the amount of brood are largely in favor of the one protected by a windbreak. Both of these hives had unconsumed stores when the spring weighing was made, but the hive in the windbreak had consumed nine pounds more than the one in the open, which it had used in brood rearing. The one in the windbreak had five frames of brood and gained 10,000 bees, while the one in the open only had 3¾ frames of brood and gained 575. The fact that the packed hive in the open gained more than the unpacked hive in the open, both in number of bees and the amount of brood, demonstrated that with other things being equal, packing was of a distinct advantage. Here again was shown the value of a windbreak over no windbreak, and, as in the open, the two-story unpacked hive gained 8,000 more bees than the one-story unpacked hive, the superiority of the large hive over the small one for wintering was shown. The superiority of the packed hive over the unpacked hive in the open again showed the value of winter protection.

Some valuable deductions can be made from these results, some of which are: When a colony has insufficient stores, even though it may apparently

winter well, yet the queen will so far slow down in her work as to seriously weaken the colony far below the strength that it would have been had it been supplied with sufficient stores. Mr. Crane's statement that if bees are supplied with plenty of honey "they can stand almost any cold for a time," and also his contention that without stores winter packing will not save them, are both strikingly borne out by the above-named figures. When considering the question of wintering bees too much emphasis should not be placed on any one feature of wintering. We know that we must have a large number of the young bees, that we must have plenty of winter stores, and also that if we can give our bees the added value of a windbreak and winter protection it will well repay us; but no beekeeper should rely on any one of these factors alone and expect to get the very best results. They are all necessary.

REMOVING THE HONEY CROP.

Honey is ordinarily produced either in the form known as comb honey or extracted honey, and the method to be followed in removing the crop will depend upon which kind of honey is being produced.

The proper time to remove comb honey from the hive is when all of the cells are sealed over, or when the honey flow is over for the season.

As comb honey depends largely upon its fine appearance, great care should be taken to prepare this honey for the market in as pleasing a manner as possible. First, the propolis and other foreign materials should be scraped from the sections, after which their appearance will be greatly improved if they are rubbed lightly with sandpaper. After the sections have been thoroughly cleaned they should be graded and packed in the shipping cases for market. The sections may be graded according to the rules adopted either by the National Beekeepers' Association or by the Colorado rules. Whichever system of grading is used, care should be taken to make sure that all of the sections in one case are of one grade, and that that grade is the one under which they are to be sold.

Extracted honey may be removed from the hive when the cells in the extracting frame are two-thirds capped over, because at this time the honey will be sufficiently ripened to be removed from the hive. It formerly was a custom to cut out the wax and squeeze it through a strainer of some sort, the product being called "strained honey." Now, however, since the invention of the honey extractor, the cappings are cut from the cells with a sharp knife, and the frames are placed in the basket of the extractor and whirled rapidly, the honey being thrown out of the cells by the action of centrifugal force. The cappings which have been removed from the cells may be placed in a wire basket and allowed to drain, as considerable honey will be found to have adhered to them, or they may be cut off directly into a capping melter, which is so arranged that the cappings melt and pass out at the front of the melter, together with the honey. The combination of melted honey and wax is caught in a container and allowed to remain until cool, when it will be found that the wax has risen to the top and the honey may be drawn off and sold.

Extracted honey appears on the market in various-sized containers, from the small-sized glass jar to the 60-pound can. The beekeeper will have to decide for himself which size he will use, and this will depend upon the market to which he caters.

COMB HONEY.

FRANK HILL, Sabetha.

My first attempt at honey production was a try for comb honey. In fact, I did not know that there was such a thing as extracted honey. I had seen but few bees, just scattered little apiaries of a few colonies each, and all that the owners of them attempted was the getting of a little comb honey. The first colony of bees I owned was a swarm that lit on a peach tree in our yard, and I furnished a hive and a neighbor hived them for me. I had been interested in bees before, and the fact that I was now owner of a colony renewed that interest. I began to get literature on the subject, and most of it came from A. I. Root Company. The Root company at that time was booming the Danzenbaker hive for the production of comb honey, and after that first colony my bees were housed in the Danzenbaker hive, which, by the way, seems to be obsolete now. You see that comb honey was my idea.

In the literature which I read I found that the big men of the bee business were writing on how to produce comb honey. The idea was to produce fine, fancy comb honey. The idea got hold of me that it required a good bee man with knowledge of the business to produce a fine article of comb honey. I had, of course, found out by this time that there was such a thing as extracted honey, but it did not appeal to me in the least. I therefore went in for comb honey, and did my best, as I have done every year since, to produce just as fine and fancy a crop of comb honey as I possibly could. Some years I have not produced a single section, but that has been the fault of the season more than my fault.

There are other reasons why I try for comb honey. The difficulty one contends with in its production makes it a sort of sporting proposition that appeals to me. If some one else can do a thing that I want to do, and he does it successfully, I want to do it or know just what that fellow knows that I do not know. I am not different in this from other men. The fact that an object is a little difficult to obtain makes most of us want it more. And there is no doubt about it being more difficult and that it requires a better informed bee man to produce marketable comb honey than it does to produce extracted honey.

I am also willing to agree with some men who say that there is a desirable flavor in comb honey that is not in extracted honey. I am unable to say why. And I am also convinced that there is some sort of a chemical difference. For instance, this winter while getting my comb-honey supers ready for the bees I found several half-filled sections of honey. Part were sealed and part unsealed. The sealed and the unsealed were both liquid, while that which was extracted last fall was long ago crystallized hard. Those partly filled sections were simply delicious and had a distinctly different flavor from the extracted honey made the same season and extracted last fall.

Then the beauty of the product appeals to me also. It is actually a pleasure to me to open supers of fine comb honey, scrape them clean, put them in the shipping case, stamp their net weight, nail them up and put them in tiers, glass side out, that I can see the whole tier. It looks good to other people also. I do not believe any person ever came into my shop while I had comb honey in sight who did not remark upon the beauty of the product. Now, I really enjoy doing anything with bees, with the possible exception of

twisting an extractor or feeding a large number of robbing colonies in the late fall. I can work longer without getting tired, and enjoy about every minute of it, in working with or packing comb honey.

There is another reason why I produce comb honey if I can, and that is, it is easy to sell and has always sold for a good price. If one has, say, 100 cases of comb honey to sell in September it makes a nice bunch of money coming in at a time when I am likely to be broke or at the breaking point, and a check which that much comb honey brings in looks good to me at any time; but when one begins to feel as if something was wrong with one's finances, and a check for from \$500 to \$700 comes in it does something towards rolling the dark clouds away, believe me. For instance, last summer was a mighty poor honey year for me, but I managed to induce the bees to produce 260 cases of comb honey. One hundred cases were sold at \$6 per case and the balance I got \$6.25 for, delivered at the river. That brought \$1,600, less the freight, and I had it all during the first week in September. There are dozens of people in my own little town who will not buy extracted honey, but do buy comb honey. They are people who do not think the extracted adulterated, either; they simply prefer comb honey. The cities are full of people who do not consider extracted honey at all, and a lot of them know nothing about any honey but comb honey, and as a rule they are people who are able and willing to pay more for it than they would for extracted honey. They should pay more, I think; as a general thing they should pay about twice as much per pound, considering a section a pound, as they should pay for extracted honey. Comb honey is the product of a specialist, in a way. The very best colonies are required to produce it; it is produced from the best sources. In many places the crop is very uncertain, and it requires more work and material to get it ready for market.

The cost of producing comb honey compared with the cost of producing extracted honey is rather hard to compute. It has been estimated that a given colony of bees will produce something like twice as much extracted honey as it will comb honey. I doubt that, if the comb-honey producer does his duty. I am satisfied that more extracted honey will be produced, especially if the bees have combs already drawn. If the bees are placed on full sheets of foundation, the difference will be a little, but just a little, in favor of the extracted-honey bees; but given good, strong colonies and a good flow, with some drawn comb in the comb-honey supers, I believe that the difference will be very little. The difference, I think, will be that the bees will have to build up to the wood in the sections, and they usually leave a little depression where the combs join the wood, while the bees on Hoffman frames build solid, and of course will make the heaviest combs. In short, I think the bees will build nearly as rapidly in a properly prepared super as they will in a Hoffman frame, both being prepared with full sheets of foundation. A frame of solid honey will weigh more, of course, than will a section holder of four sections of the same dimensions, because the depression next the wood takes off a little and the wood where the sections join takes up a little space. But comb honey is not sold by the pound; it is sold by the one or two dozen sections. I have never had a buyer complain of honey that weighed as much as eleven ounces net. I have had them ask me if the honey was heavy before they bought, and of course heavy, well-filled sections are to

be preferred, but I have never been asked to cut the price on account of the weight. I will say here that I believe the *average* section I produce will weight about 12½ ounces net. I have shipped considerable honey weighing ten ounces net, but have voluntarily taken one dollar per case off the price. I do not believe, as a matter of fact, that a cent was taken off the price when it was retailed. It costs more to produce comb honey than it does extracted honey, because of the sections and foundation that must be furnished every crop, and to this must be added the cost of shipping cases and crates in which the shipping cases are packed. Last fall it cost me for material for a case of comb honey as follows:

Shipping case	\$0.85
Sections .....	.21½
Foundation .....	.11½
Crates (one-sixth of the cost of a crate holding 6 cases).....	.20
Total	<u>\$0.88</u>

The whole cost being 88 cents for the material to get a case of comb honey ready for market. Calling a section a pound would make the case of honey comparable to 24 pounds of extracted honey. To make the figures even we will say the case weighs 20 pounds, which it will weigh. To get 20 pounds of extracted honey ready to sell it must be packed in, say, the 5-pound pail. When cost and freight are added, a 5-pound pail will cost, or did cost me, about 9 cents each, four 5-pound pails costing 36 cents. Say one can sell the 5-pound pail for \$1, making the 20 pounds bring \$4. The difference is that I sold the 20 pounds of comb honey at \$6.25 with an expense of 88 cents, leaving a profit of \$5.37 to me. You see I have a difference of \$1.82 to pay me for the extra trouble in getting supers ready and the extra trouble it requires in working the bees. One thing to take into account in favor of comb honey is the taking care of extracting combs. They must be either put back on the bees or thoroughly treated to kill and prevent the wax moth from destroying them. It does not cost quite as much per pound to pack extracted honey in 60-pound cans, but the price per pound for it in that size package is nearly always less. It can be seen that even if the bees do not produce as much comb honey as they do extracted, the price averages, or has averaged with me, about two-thirds more. The prices I quote are the highest I received for both kinds this last year. The work of getting the supers ready, folding the sections, putting in the foundation, etc., comes in the winter when a little work is welcomed, and I would rather have it to do then than not. It is mighty bad business for a bee man who has as many as say 100 comb-honey supers to get ready to wait till he sees whether there is going to be a crop or not. It requires too much time, and the bees will not wait for anything, and it pays to have everything all ready.

Now, as to handling bees to produce honey, there are, I believe, almost as many systems as there are men. There are plenty of books, and good, well-written books, by men who have had experience and know the game. If I haven't read them all it is because I have not been able to get them. I am not going to attempt to tell you how it should be done. You can get books that will tell you that. I will try to tell you how I work, and the plan may or may not suit you.

My bees are all in outyards. I have more than 400 colonies, and they are all in the country, or will be in the spring, but a dozen or so that I keep at home to raise queens with and help with increase there. You see that any intensive plan such as you will find in Doctor Miller's "Fifty Years Among the Bees" is out of the question. First I will tell you why my bees are in small outyards. My location is a good one, providing it rains enough, which it does not often do. But very often one locality just a few miles away will get one or two rains in one season that another location will not get. I have had one or two yards give me a fair crop, while others in the same season had to be fed for winter. A rain makes a big difference. My bees are in eight yards of from thirty-four to sixty colonies each. My bees are wintered—or that is what I try to do—in two hive bodies. I use ten-frame hives. If they should be wintered on one set of combs I put another set on in the spring when I unpack them. They then have plenty of room for almost any kind of a queen. I clip all queens in the spring, and try to get it done during fruit bloom. Then an inventory of the hives is taken and the condition of the colonies is marked on the hives. One can devise any way to do this that suits. When I clip a queen I put an X on some part of the hive, with the date. When I find a clipped queen I put an O there. When I find no queen I put a QX there, so I know where to find them with a new queen. At that time a colony must have plenty of stores to sustain it until the flow. After the stores are supplied and the requeening is done, they are left till they begin to build up pretty strong. Then I inspect and see that there are no queens confined in one hive body. Sometimes a queen may be in the upper body and never seems to find the lower one at all. All I do is to reverse the bodies, putting her below, and she is sure to go up. I usually see that the queen is in the top body in the spring, as it is warmer, hence this last manipulation. The bees are not disturbed till nectar begins to come in rather freely from white clover, and if that misses out, till sweet clover. When nectar is coming in and the best colonies have the combs well covered with bees, I put the queen below with three or four frames of brood, put the excluder on, and the rest of the brood on top. At this point I am differing from many others, I know, as we heard here last year. It has been advised to put the queen below with only one frame of brood. I believe that to be more or less of a backset to the bees. There are not enough bees on one frame to keep many bees downstairs where the queen is, and I am sure the queen curtails her laying till more are hatched and there are more young bees in the lower body. I have tried the one-comb method, with the result of losing part of the queens. I usually put below at least two frames of sealed brood and one frame of open brood. The bees are then left alone until they are working well in the supers. To get comb honey there must be a flow of at least three pounds per day—the more the better, but I have had a good crop with a flow that barely exceeded three pounds per day through the whole flow. When bees are going good in the supers I put on comb-honey supers. Previous to this time, at the time I put on excluders, I mark the colonies in this way: the best colonies, those with the more prolific queens and the most bees, I marked No. 1; the next best I marked No. 2. When I am ready for supers I know just where to put them. I go to the No. 1 colonies and take off the top body. I take what brood there is there and put it below till

the lower body is full of brood of some kind. If there is not enough I go to one of the colonies not marked at all and get some, but seldom have to do that. I usually leave one empty or partly empty comb for the queen to lay in immediately. Then I put on supers, usually two. If the flow does not look good and it seems to me as if it would not last long, I put on just one. Even if the flow is short and not very strong I can get one super filled. As a rule there are two, and in the bottom super there are either two side combs drawn out—I mean extracting combs—or there are one or more drawn combs in the sections. If that condition prevails the bees will occupy the sections almost at once, and in a short time the super is filled. Before the super is filled I transpose the two and put the lower one on top. If the bees are producing heavily I put another on at that time on top. The next visit I will shift the lower one on top if it is finished, as it usually is, and keep supering as the bees need it till the flow stops. Sometimes I will find bees working in one side of the super. That super is turned around so the side worked on is opposite from where it was, which induces them to begin the other side. The bees must be watched as closely as possible during the flow. I make the different yards about once a week. The hive bodies I take off the comb-honey colonies are given to the bees I did not mark at all; and as there is usually a little brood in them, I frequently put it right down in with their own brood if the colony looks as if it needed help. If honey is coming in strong and the No. 2 colonies possibly need room, I have extra supers for them right in the yard. One must use judgment in supering, as it is easy to overdo it and get a scattered lot of unfinished honey, or crowd them too much and not get the crop one should, and induce swarming.

The big question is, of course, swarming. I hereby admit that I know little about it. I have read a lot, all that I have found, and do not think that anyone has very much positive knowledge about it or how to prevent or stop it after the bees have the notion of swarming well established. I believe we do know what induces it, but if it is known how to keep a strong colony of bees working in a confined situation such as comb-honey supers, without swarming, I do not know who knows it. Some colonies will do that very thing; some will attempt to swarm at almost the first symptom of crowding. Why one colony should swarm and another not, under the same conditions, is what I do not know. After a colony has shown the intention of swarming, all my own attempts to prevent it have been failures. I have tried all the varieties of shaking I have ever heard of and invented a few of my own. I have shaken them on empty combs, on full combs—that is, combs of honey—on partly filled ones. I have shaken them twice and three times in the same day, and every time I have shaken a colony of bees that are getting ready to swarm, and shaken them with their own queen, I have failed without exception. Some one else may have a different movement than mine, but my own does not do the business. They will not go to work by that manipulation.

One way I have succeeded in making them work was to take their queen entirely away and leave just one queen cell without brood till the cell hatches, then giving it back to them after the queen has mated. They will then work in a sort of listless way till the young queen hatches, and then they are all right; but I have lost some valuable time, of course. I have also tried the following with success: Take the queen away with one or two frames of

brood, shake out all the bees some distance from the hive, and set a weak colony on the stand that has a good queen. I put the old queen with one or two frames of brood on the stand I took the weak colony from. I destroy all queen cells in the old hive and let the bees return to this hive. I have had them go to work almost at once after that manipulation. The new queen seems to put a new sort of aspect on things, and being shaken and disorganized, they have always accepted the new one and have gone to work. At that time, if I still have more comb-honey supers to fill, and flow continues, I can then go to one of the colonies marked No. 2 and make the same manipulation before described, take their extracting super and put it on one of those not marked, and give them comb-honey supers. They will be by that time in condition to build sections, and just as good as the ones marked No. 1. It will be seen that I do not give any colony comb-honey supers until they have been well started working upstairs and have the storing habit established. I do not have many or a large per cent of colonies attempt to swarm when the plan is followed, but I do have some. In my largest yard last year, one of sixty colonies, I had five colonies try to swarm out of thirty that I had on comb-honey supers. That yard did not have the best flow. The one that had the best flow, a yard of fifty-three colonies, with thirty-five comb-honey colonies, did not have a single one attempt to swarm that I discovered; but of course I might have missed out on one or two. This is my best reason for clipping the queen.

I make weekly visits during the flow. It is easy to discover a colony that is making the attempt to swarm, if the queen is clipped. They may be clustered over the outside of the hive. They will not be in the supers when other colonies are. The queen may be in the grass with a bunch of bees with her. If the bees do not seem normal, are not working as they should, or as the others are, a look in the brood chamber will reveal whether they want to swarm or not. If the queens were not clipped they very likely would be gone when I got there, or hanging on some of those big trees on the highest limb they could find. Another good reason for clipping the queens is that I can keep a line on the age of the queens and look the combs over for disease. I do not requeen at any given time, as I have not seen fit to do that as yet; but I know where the poor queens are, and then when I find those good, big supersedure cells I know right where to put them.

Another thing in favor of comb-honey production is the fact that bees will not build in sections till the lower body is full of something, either honey or brood, and they keep it full. When fall comes you are quite sure to be well fixed with winter stores. It is very different in producing extracted honey. By putting brood upstairs bees will work up there whether there is anything below or not. I have, and no doubt you have, found a full hive body on top with nearly nothing below. I had that demonstrated to me this last season to my satisfaction. I had a poor year—two days of twenty-degree weather during fruit bloom—and those days were a week apart. One day it got down to fifteen degrees. Everything that ever produced a drop of nectar was killed—even the dandelions, and that is going some. The bees were short of stores on account of it. I, like most beekeepers, depended upon somewhat of a spring flow. I do not any more, but I did. I had to feed until white

clover showed up. When it did show up it was a mighty poor showing. Nobody would sell a hoof of stock last winter or spring, and everybody had more stock than feed. As fast as a clover head would get in bloom it was eaten off. I got nothing from it at all, but just enough to keep the bees breeding till sweet clover came. I have no complaint to make on what the sweet clover did. I had a good flow for about four weeks. I harvested 260 cases of comb honey from the hives at that time, and about 9,500 pounds of extracted honey; and those colonies were in good shape. I sold the comb honey. Then dry weather came. Heartsease bloomed, but the weather was so dry that there was no nectar in any kind of bloom. It stayed dry till frost. Of that 9,500 pounds of extracted honey I had to give back to the bees 6,000 pounds or go out of the bee business. I did not need to feed the comb-honey colonies more than 500 pounds altogether, all of which seems to me to be a mighty good argument in favor of comb honey. I found colony after colony with not a pound of honey in the brood chamber and a full ten-frame body above, in which case I simply took out the excluder.

I would not advise anyone to attempt to produce comb honey if he will not take the time to attend to the bees during the nectar flow. If they are neglected and not properly supered one will not get the crop or there will be an unnecessary amount of swarming. If one has but little time I think extracted honey would be the kind to produce. There is little if any trouble about swarming, but if full-depth bodies are used for supers the supering is but little trouble, if one has them to put on when needed. It is not best to put on two or three and let them go. One might have to do that way and get a good crop too; but if nice, fat combs are produced they will be produced where the bees have not too big a surface to cover. It is not advisable for anyone to attempt to produce comb honey alone. The flow is not always good enough for comb honey, and there are always colonies in any apiary that are not strong enough for comb honey but are strong enough to store extracted honey. It seems to me that the beekeeper should produce both. If one has the equipment and is ready for a big crop and the good big season we all look for every year, and gets all the comb-honey supers filled, he is far ahead financially of what he would be if producing only extracted honey.

About sections and filling sections with foundation: I have tried three arrangements that are supposed to fasten foundation to the top of the section by the hot-plate method. They have been a rank failure with me. There is not enough melted wax to do the job so they will stay. You know, as my bees are in the country, the supers have to be handled several times and then take some bumping on the road, and I want that foundation to stay put. I use full sheets, of course. I cut the foundation so it just fits inside the section, and then with melted wax, that stands on an oil stove near me, I fasten the foundation to the wood. I use a bristle brush with a long handle. They are what are sold as artists' bristles, and a flat one is better than a round one, and should be about a quarter of an inch wide. While fastening foundation that way is not the fastest way, it is much faster than the Van Dusen fastener, and the beauty of it is that it does the job, and a super has to have rougher handling than I ever gave one to loosen foundation from the section. I have tried half sheets of foundation, a short starter, and a sheet about four-fifths the depth of the section and then a bottom

starter. I really think the latter is the very best method of putting foundation in sections, but it is troublesome, and I have been cutting my sheets so they will just go in the section and fastening them on three sides with wax as described. If one uses a short starter he will have many sections in a crop that are not fastened at the sides or bottom. He will have many built nearly full about half way down, and then quit. He will have a lot of chunk honey in sections, which is too expensive a way to produce chunk honey. If the flow is good and the bees are strong one can get good comb honey with short starters. If one uses full sheets the bees will begin sooner without crowding, will fill the sections quicker, there will be few half-built sections if properly supered, and there will be light sections instead of chunks reaching half way down, and the light sections will be straight and marketable.

When I see the crop coming I order shipping cases and get them nailed, and as fast as the supers are packed I fill the supers with new sections, having a large number ready and waiting for that time. The reason for that is that sometimes we get a big heartsease flow in August and September, and I want to be ready for that in case it does come. Another reason for getting the comb honey off as soon as it is done is to prevent the bees from getting it travel stained and injuring the color. In packing it I sometimes find a section or two that are not finished. I fill supers with these and give them back to the bees, as I always start packing before the flow is entirely over, if possible. If I have a quantity of these left after the flow is over, and they are too light to market, I extract them and save the combs and sections, dividing them up in the supers for the next year. The foundation and the sections are not wasted, and the bees start much sooner in a super that has one or more of these combs in it.

In getting the honey ready for market I have a heavy work bench about waist high. I put the full supers on this, and with a stiff painter's putty knife, ground sharp on one side like a chisel, I scrape the top of the sections just as clean as possible while they are still in the super. When the tops are clean the rest is easy, as just a little cleaning finishes the job, the rest of the section being protected by the section holder. The net weight is stamped on the top, they are put in the cases, nailed up, and are ready for the crate. The crate is arranged to hold six cases with handles. Comb honey must be well packed for shipment, and these crates must be rightly planned and stiff enough to stand all likely strain. I will say that I have never had a damaged shipment of comb honey. I pack it so well that it will require a wreck or the limit in carelessness to damage it.

To you extracted-honey men I would suggest getting some comb-honey supers. You will find a quick market for all you can produce and more. Our honey is finished and can be made ready to sell before the cheaper western honey gets here, and that is the time to sell it. Early in the fall people begin to think about honey, and that is the time to get it on the market. I believe you will find it a most attractive branch of your business, and I wish you success.

EVERGREEN TREES FOR ORNAMENTAL AND
PROTECTION PLANTING IN KANSAS.

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The first requisite of a tree to qualify for a place in ornamental or protection planting in Kansas is *hardiness*. After satisfactory hardiness has been proven we can then begin to make a selection of species because of their merits along such lines as rate of growth, grace and beauty of form, symmetry of outline, dignity of character, and harmony of color and shade.

Hardiness of a tree is the inherent ability to grow and develop into perfect stature in the region under consideration. Frequently hardiness is referred to only in respect to the ability of a tree to withstand the minimum temperature of our winter weather. If we were discussing tropical trees this might be the only factor that we would need to consider. The frost line determines their northern limit of range. But when trees are brought into Kansas from the southern states we must also consider their ability to grow successfully in our dry atmosphere and dry soil during certain seasons.

Our dry atmosphere is perhaps the greatest factor in determining the hardiness of species suited to our conditions. Were it only a matter of enduring our minimum winter temperature it would be a safe conclusion to say that all trees growing in the northern states are hardy in Kansas. This is far from being the case. The fact is, very few of the northern species are hardy here. The white pine, red pine, the spruces, the birches and the sugar maple are the outstanding trees of the northern states. Of this list very few will grow in the state, and they are only half hardy.

To sum up what is meant by hardiness of a species, we may say it is the inherent ability of a species to survive the heat of summer, the cold of winter, the excess of moisture or the drought of the region under consideration. Under drought we include the atmosphere as well as soil conditions.

Hardiness is a species characteristic. A white elm grown in Alabama or Mississippi is equally as hardy as a white elm grown in Montana or North Dakota. The elm trees of these two regions are very dissimilar in form, but this dissimilarity is due to the effects of climatic conditions of the two regions.

The red cedar of our own state is very unlike the red cedar of the Ohio valley or of the New England states, yet they are identical species.

There are few distinguishing characteristics of a species that will help the layman determine their hardiness, and this quality can only be determined by a "tryout." This trying-out process has been going on in Kansas for the past seventy years, and if we will look around and take note of the trees that we see growing successfully, which have been growing for a number of years, we will soon have a complete list of hardy trees and shrubs of the state or of any particular community. This list will have to be added to from time to time as new species are brought in and their hardiness proven. The Bureau of Plant Industry is bringing species in from foreign countries and distributing them in regions where they are most likely to succeed and to contribute to the development of the country. A recent introduction is the *Ulmus pumila*, a Chinese elm, that, so far as can be judged at present, is entirely hardy in the Great Plains region lying between the Missouri river and

the Rocky Mountains. This is a tree of unusually rapid growth in regions of scant rainfall. It is pleasing in appearance, is long-lived, and in all respects a very promising tree for this state.

But to get back to my subject, "Evergreen Trees for Ornamental and Protection Planting in Kansas," the following is a list of evergreens that are growing successfully and may be considered entirely hardy within the state:

Red cedar	<i>Juniperus virginiana.</i>
Austrian pine	<i>Pinus sylvestris.</i>
Western yellow pine	<i>Pinus ponderosa.</i>
Jack pine	<i>Pinus divaricata.</i>
Swiss mountain pine	<i>Pinus mugho.</i>
Dwarf juniper	<i>Juniperus canadensis.</i>

In addition to the above we may add the Chinese arbor vitæ as hardy throughout the southern half of the state. This tree has failed repeatedly in the northern half of the state and can be considered as only half hardy in this section.

For the eastern half of the state the following may be added to the above list:

Colorado blue spruce	<i>Picea pungens.</i>
Black Hills spruce	<i>Picea canadensis</i> (var. Black Hills.)
White spruce	<i>Picea canadensis.</i>
Norway spruce	<i>Picea alba.</i>
Douglas fir	<i>Pseudotsuga taxifolia.</i>
Silver fir	<i>Abies concolor.</i>
Bald cypress	<i>Taxodium distichum.</i>
Table-mountain pine	<i>Pinus pungens.</i>

Of this list the silver fir and the bald cypress should be planted only where they will be protected from southwest exposures and only in fairly moist soil.

The red cedar is the only evergreen that is native of the state, and it is by all odds the hardiest of the above list. It is a tree that has been condemned to oblivion by many an ardent enthusiast, but in spite of all such condemnation the fact remains that it is the most useful of all evergreen trees for ornamental and protection planting. In my opinion it heads the list without an exception. It grows successfully in all soils in which any tree will grow. It lends itself readily to any desired formal treatment. By beginning early it can be developed into a column, a pyramid, an oval, or even into fantastical designs. There is no tree better suited for formal garden planting than the red cedar. It makes the most compact hedge of any of the evergreens. After shearing it a few years its surface is so dense that a bird can scarcely go through it. For cemetery planting it is unexcelled, as it can be kept cut to any desired size. For landscaping it is unequalled. It is graceful and sweeping in its natural form and it blends in perfect harmony with broad-leaved species. There is no tree that equals it for planting on rocky prominences or on dry, uncongenial soils.

For use as a windbreak the red cedar has no equal in Kansas. It transplants readily, grows more rapidly and has denser foliage than any other of our evergreens. Its sweep of limbs from the ground up presents almost an impenetrable barrier to the storms that sweep across our borders. In its rugged picturesqueness it stands a symbol of strength and durability, and continues for years and years to grow and perform a service to bird, beast and man.

To economize in words and time we will discuss the pines as a group. The species vary more or less in appearance, but all have the same habit of growth and all serve the same purpose. The selection of species is but a matter of choice. I consider the Austrian, Scotch and western yellow pines equally hardy, and each will grow in fairly moist soil. They never suffer from the cold of winter and they survive the heat and drought of summer equally as well as the hardiest of our broad-leaved species.

Groups of pines should be used in all landscape plantings. They give a touch of dignity that no other tree offers. The deep green of their foliage is a pleasing relief throughout the entire winter. The pines are excellent trees for windbreak planting, especially for protection to orchards. They are not hosts to insects or diseases that are enemies to orchard trees.

The jack pine should be considered in a separate list. It is a sand-loving tree and should be planted only on a very sandy land that is less congenial to the other species. The jack pine grows successfully in barren sand where no other vegetation succeeds. It should always be planted in clumps or groves to prevent the wind from blowing the sand and also provide shelter for man and beast.

The Swiss mountain pine and the dwarf juniper are dwarf species that are used entirely for ornamental planting. No landscape planting is complete without a number of each of these species filling in the foreground or serving as the foundation planting around our public buildings or covering rocky knolls or slopes. These are perfectly hardy trees and their use in landscape work is limited by the small number that are available from year to year.

The spruces, firs, bald cypress and table-mountain pine are decorative species. In this state their use is limited to yard and landscape planting. The spruces and firs possess a charm and dignity that adds much to the beauty of any yard. The varying shades, from silvery gray to a green so deep that it is nearly black, is always pleasing.

The cypress is a graceful tree, with sweeping branches and featherlike foliage that always invites a compliment. It is a tree of remarkable growth, but unfortunately it is only half hardy in Kansas and should be planted only in locations where they will be well protected from the summer drought and also from the severe cold of winter.

The table-mountain pine is a rugged, picturesque tree with a charm distinctly its own. Its crooked horizontal branches are studded with an accumulation of large, prickly cones that cling for many years as novel decorations. This species should be used more commonly in all landscape plantings.

The Chinese arbor vitæ is a highly satisfactory tree throughout the southern half of the state and southward through Oklahoma and Texas. The individual trees of this species vary greatly in form. The dense, compact types are highly formal, and their special use is in decorative plantings in lawns and cemeteries. The less formal type when kept cut to the desired height make a beautiful hedge. If allowed to grow without care or treatment they make a very effective windbreak. In all respects the Chinese arbor vitæ is more like the red cedar than any other trees of the above list. These two are the only evergreens that are hardy in Kansas that submit to shearing and can be used for hedges or other formal planting.

The evergreens listed above are a highly valuable group of trees for Kansas development. They improve and beautify the property on which they

grow. They add a charm and beauty to parks and cemeteries that no other trees afford.

They are unsurpassed as ornamental trees. No other tree remains green throughout the summer and winter; none are more beautiful. While their value is great in this respect, evergreens are most useful for the protection they give. They protect the homes, the live stock, the growing crops and the birds from the heat of summer and the cold of winter and the raging storms of the entire year.

A grove or clump of evergreens is one of the most distinctive and outstanding features of a farm. They serve to identify a farm in any community. They give a farm home a touch of coziness that nothing else can give.

Evergreens grow rather slowly, but when once established they soon attain a sufficient size to be of great worth. The fact that they cannot be grown in a day or in a night only emphasizes the fact that we must plant now if we expect to enjoy evergreen trees in the future.

THE DEVELOPMENT OF THE MODERN PEONY.

JUDGE CHARLES J. TRAXLER, Minneapolis, Minn.

The peony has been of more than ordinary interest to the human family for many ages. That it is entitled to classical antiquity is unquestioned, but how far back on the calendar of time to place its origin may never be determined with certainty.

ITS MYTHOLOGY.

The peony is frequently mentioned by the writers of Grecian and Latin myths and legends. From these we learn that the peony was named for a famous physician named Pæon, a pupil of Æsculapius, who by means of this herb cured the god of war, Mars, of a wound supposed to have been vital, which he received in the Trojan wars. Other miraculous cures are attributed to Pæon, whose great skill in healing is imputed to his use of this plant. It is said that his skill became so great that Æsculapius became jealous of his growing fame and had him secretly put to death.

The plant is supposed to possess some occult charm. A piece of dried root worn on the person was supposed to make the wearer immune from all kinds of contagious diseases and especially from nervous or mental disorders. It is recorded that a dose of the powdered root was a sure cure for all forms of convulsions and violent nervous disturbances. Its supposed charm extended to the evil spirits. A plant or two by the cottage door was supposed to protect the inmates from the scourge of evil spirits. This may account, in part at least, for the wide distribution of the plant throughout Europe.

ITS ANCIENT HISTORY.

Historical writings of unquestioned authenticity speak of the plant as early as 600 B.C. It has been known in China for centuries, probably long before any historical record of it had been made.

The species *Pæonia officinalis* is native of southern Europe. It is found wild in Spain, southern France and in Italy and Greece, and though it is widely distributed in the more northern European countries and in the

British Isles, it is not native there. It is to this species that the curative medicinal quality is attributed, but it has not yielded to intensive cultivation nor to crossbreeding, and is no longer considered to any great extent by the hybridizer and originator of new varieties.

The species *Albiflora* (the white flower) is native in Siberia and northern China. It is said that one of the earliest Chinese writers, about 600 B. C., described this plant and mentioned the wonderful beauty of its flowers. The peony is known in China as the "sho yo," or "most beautiful."

ITS MODERN HISTORY.

The species *Albiflora* probably was introduced from China into Europe by European travelers in the Orient, who brought back with them many specimens of this wonderful plant, and doubtless this has been done for centuries in a small way, but no authentic records have been made or preserved. The first authentic record of importance is at the beginning of the nineteenth century. Among the earliest of these, a brief account is of an importation by Sir Abraham Hume, who introduced into England the variety *Humei* about 1810. Whether this variety was originated by Hume or was imported and named by him is not definitely settled, but the probabilities are that it was imported, as there is no authentic record of his having produced other named varieties.

In 1805 *fragrans* was introduced and brought from China by Sir Joseph Banks.

One authoritative writer states that the *Pæoni officinalis* is native in the mountainous woods of Helvetia, Provence, Montpelier, Dauphine, Piedmont, Carinola and the Grecian islands, and most of the hilly regions of the south of Europe, and that it is frequent in Spain, particularly on the mountains of Avila.

A paper published in 1588 states that a double red peony had recently been introduced into Antwerp, and that the first plant sold for twelve crowns.

Perhaps one of the first men to raise seedlings and after due selection offer them as named sorts was M. Lemon, of the Porte St. Denis, Paris, who about 1824 introduced *Grandiflora Nivea Plena*, *Grandiflora Carnea Plena*, and *Edulis Superba*. Melanie Henri is generally catalogued as "unknown," but it also was probably introduced by M. Lemon. Modeste Guerin, of Paris, introduced some good varieties such as *Modeste Guerin*, in 1837, and *Grandiflora Rosea* in 1850.

Another French introducer was M. Victor Verdier, of Paris. Among the best of his introductions, and one that still holds high rank in the estimation of connoisseurs, is *Marie Jacquin*.

One of the most successful French introducers was M. Calot, who originated varieties from about 1845 to 1872, some of the best of which are *Eugene Verdier*, *Triomphe de l'Exposition de Lille*, *Mons. Dupont*, *Couronne d'Or*, *Mme. Calot*, *Mme. Crousse*, *Livingstone*, *Felix Crousse*, *Modele de Perfection*, and *Mme. Geissler*.

Among other French introducers was Delache, whose best introduction was *Delachei*, which is the only one that has endured to the present generation. About the same time, 1856, Buyck produced *Festiva Maxima*, which was later reintroduced by Mielliez, to whom modern catalogues usually attribute its origination.

Following Calot, in the order of importance, is M. Crousse, the best of whose introductions are Claire Dubois, La Rosiere, Albert Crousse.

Following Crousse, in order of time, is M. Dessert, whose most popular introductions are Mme. Bucquet and Albiflora. A contemporaneous French grower is Lemoine, whose best introduction is La France, which is probably the best pink of European origination. Another contemporaneous introducer is Renault, whose most popular introduction is Lord Kitchener, one of the earliest blooming good, dark reds.

The most widely known introducers in England are Kelway & Sons, father and sons, who have been operating for many years and are still introducing some very satisfactory varieties. Three of their best and most popular varieties are Baroness Schroeder, Lady Alexander Duff and Kelway's Glorious.

Among the earliest American introducers is H. A. Terry, of Crescent, Iowa, who began his operations about 1856 and continued during the remainder of the nineteenth century. Perhaps his latest and best introduction is Princess Ellen. Others are Grover Cleveland; Etta, a light pink; and Rachel, a dark, rich, ruby red.

Another American introducer who deserves mention is John Richardson, of Dorchester, Mass., whose work extended from 1857 to 1887, during which time he introduced some very good varieties, the best and most popular of which are Richardson's Grandiflora and Rubra Superba.

Mrs. Sarah A. Pleas, of Spiceland, Ind., began her operations about 1880, and her first introductions were some time later. Among her best are Jubilee, Eswood Pleas, Opal, and Walter Morgan.

J. F. Rosenfield, of Nebraska, introduced a few interesting varieties, the best of which are Floral Treasure and Karl Rosenfield.

About the same time C. S. Harrison, of York, Neb., who was probably the best peony expert in America, began to develop plants on his own account, and about 1904 he introduced several very excellent varieties. One of the most charming and delicate of peonies is his Nymphia, or The Nymph. Another very good variety is his C. S. Harrison, and his best red he named Red Jacket, after the Indian chief.

O. F. Brand and his son, A. M. Brand, of Faribault, Minn., introduced a large number of varieties, some of which have exceptional merit. Among these are Elizabeth Barrett Browning and Frances Willard, their best whites; Phoebe Carey and Martha Bulloch, their best pinks; Richard Carvel and Longfellow, their best reds; Moses Hull and Chestine Gowdy, their best tricolored varieties.

About this time Mr. Hollis, of Massachusetts, introduced some very excellent varieties, the best of which are Standard Bearer, a magnificent clear, flesh pink, and Loveliness.

Mr. Shaylor, also of Massachusetts, one of the later introducers, contributed some excellent varieties, the best of which are Mary Woodbury Shaylor, a beautifully shaded pink; and Mrs. Edward Harding, the latter of which took the one-hundred-dollar prize at the American peony exhibition in 1919.

There are several others who are interesting themselves in some degree in the production of new varieties of peonies, only two of whom will be mentioned here. The late John M. Lewis, of Copenhagen, N. Y., introduced

several varieties, one excellent dark red, which he named Mrs. John M. Lewis. Other very choice seedlings of his will he introduced later.

One of the latest competitors in the line of introducing new varieties is A. B. Franklin, of Minneapolis. Two of his introductions were awarded prizes by the North American Peony and Iris Society this season; his Mabel Franklin, a beautiful pink, being awarded first prize, and W. F. Christman, a delicately shaded pink and white, being awarded second prize.

ENVIRONMENT AND HEREDITY AS APPLIED TO MAN AND FRUITS.

MRS. JAMES SHARPE, Council Grove, Kan.

Tennyson wrote his poems when woman's place in public life was not so popular as it is now. In his ode to memory he gives us a glimpse of his early home. And the serious purpose of his Princess is found in these lines:

The woman's cause is man's; they rise or sink
Together . . .
For woman is not undeveloped man,
But diverse. Could we make her as the man,
Sweet love were slain; his dearest bond is this:
Not like to like, but like in difference.
Yet in the long years like must they grow;
The man be more of woman, she of man.

We believe that men are not as interested in breeding to perfection the human race as the women, but are more absorbed in perfection of the plant and lower animal life; therefore we are trying to handle our subject more from the human standpoint.

When Oliver Wendall Holmes, physician, scholar and poet, was asked at what age we should begin to live aright, he replied, "Two hundred years before we are born." Behind this half-humorous answer lay profound wisdom. It is clear that we cannot provide two hundred years in advance for our own welfare, but we can provide for the welfare of our progeny. By providing wisely and consistently for the birth of children the parent may implant within them, by the law of heredity, a tendency which they will naturally follow. Their children in turn will inherit a still stronger tendency toward right living, so the sixth generation which appears two hundred years later will be vastly superior to the parents, six generations preceding them. All of our improved plants and domestic animals came originally from wild and crude stock, which by intelligent breeding and cultivation have been brought to the present state of development. It is only in the human, the only thing created in the image of God, that we disregard the laws of heredity and prenatal influence, while we give the most intelligent attention to the law of improvement in the case of animals and plants. Luther Burbank in his book, "The Training of the Human Plant," says that it is impossible to separate heredity and environment, and that heredity is only the sum of all past environment. In other words, environment is the architecture of heredity, and that acquired characteristics are transmitted, and that all characteristics which are transmitted have been acquired. Not necessarily at once, in a dynamic or visible form, but as an in-

creasing latent force, ready to appear as a tangible characteristic when by long-continued repetition any specific tendency has become inherent, inbred or fixed, as we would call it. Frances Willard said that a child's first right is to be well born, and that few children, comparatively, are well born, because few parents pay any attention to the laws of heredity or prenatal culture. These laws have been studied and successfully applied to the improvement of the lower animals for centuries, while the children of men have been born in ignorance, broken laws and unguided propensities, dissipated and dishonest fathers, and nervous and irritable mothers, who stamp their abnormal tendencies upon their offspring. The men and women of to-morrow will carry with them the mental weakness and unreasonable whims that characterize the mother prior to their birth. She mayhap is forced to labor far beyond her strength, she may lack sympathy and the tender care that is her right, yet if she gives vent to malice or anger, or even harbors them within her breast, nature is inexorable, and her offspring must bear the stamp of inherited evil temper or whatever else may have influenced the mother during the child's prenatal existence. Can we properly estimate this influence through the generations to follow? Occasionally a child is born with characteristics entirely different from those of either parent, which were instilled into it by the surroundings or occupation of the parents. It was discovered in the case of Jesse Pomeroy (the boy murderer) that although his parents were excellent persons, his father was a butcher, and his mother frequently visited the shambles several months prior to his birth, neither of these parents had ever developed a murderous tendency, and yet they were so familiar with the taking of life and the shedding of blood that doubtless this habit influenced the unborn child to such an extent that he very early became a murderer. We call to mind the life of Susanna Wesley, who with the song of praise and the gospel of peace in her heart gave birth to the great Wesleys, John and Charles, whose sermons and songs set in motion a wave of blessing that has carried peace to thousands of souls the world over—herself no singer or preacher, but living the song and sermon that found expression in her sons. We should begin our work even here, in that mysterious prenatal period throwing around the mothers of the race every loving, helpful and ennobling influence possible. In the doubly sacred time before the birth of a child lies far more possibilities than we can ever know. This period embraces the hope of the future of an ideal race which is to people this earth, if we and our descendants will it so to be. We may also gain strength by the mingling of the races or by crossing of types; strength has in one instance been secured, in another intellectuality, in another moral force. Nature alone has done this. The work of man's mentality has not yet been summoned to prescribe for the development of a race. But when nature has done its duty, and the crossing leaves a product which in the rough displays the best human attributes, all that remains to be done is proper selective environment. Animal and plant life are susceptible to environment, but of all living things the child is most sensitive. Surroundings act upon it as the outside world upon the plate of the camera. Every influence will leave its impress upon the child, and the traits which he inherited may be overcome to a certain extent, in many cases being even more apparent than heredity. A child absorbs environment, and if that force be applied rightly and constantly when the child is in the most receptive condition the effect will be pronounced,

immediate and permanent. Children must be reared in love and surrounded with all the influences of love. Love must be the basis of all our work for the human race—an abiding love that outlasts death. A man who does not love his plants and trees or is neglectful of them, or who has other interests beyond them, could no more be a successful plant or tree grower than he could stem the tide of the ocean. You can never rear a child to its best estate without love. Choose what improvement you wish in a flower, a fruit or a tree, and by crossing, selection, cultivation and persistence you can fix the desirable characteristics irrevocably. Select any trait you may wish in your child—granted that he is a normal child—be it honesty, purity, fairness, loveliness, industry, thrift or other desired virtues, by surrounding this child with sunshine from the sky, and your own heart, and giving him the closest communion with nature by feeding him well-balanced, nutritious food, by giving him all that is implied in healthful environmental influence, we can thus cultivate in the child and implant for life all of these traits—naturally, not in all cases at the beginning of the work, for heredity will make itself felt, and as in the plant under improvement, there will be certain strong tendencies to reversion to former ancestral traits; but in the main we can give him all these traits by patiently and persistently guiding him in his early, formative years. Jacob Riis, in his book, "Peril of the Home," says three-fourths of the young men who land in the reformatory are without moral sense, yet of average mental capacity, which is to say that they had the common sense to benefit by their opportunities had we put any in their way, but we did not. He says that about 92 per cent had bad homes, or homes which at all events had no good influence upon their lives; and in this it is emphatically true that, "that which is not for is against," and unless the home is a saving influence in the lad's life the door has been opened for all that is evil and corrupting. More than 90 per cent were adrift at the age when character is formed, and only one in a hundred escapes bad company—and the street has no other company, and the street is the alternative for the home. There is the heredity made to order, of which we groan, ever ready to give up, to place the blame on the Almighty for our own shortsightedness, our selfishness and love of ease. This heredity in ninety-nine cases out of a hundred is just the result of wrong environment, which is in our power to correct if our efforts are timely. The hundredth case we can leave to the Lord, who inflicts the sins of the fathers upon their children only in them that hate Him. To them who would do His bidding by doing His work in the world, He is ever ready to show a way out. The way is to keep His commandments, the old and the new—that sums up all the rest. Loving our brother, we shall not be found wanting, but will fight all things that drag him down, and we shall not only be improving his chances in the to-day, but we shall be destroying the heritage of sin and sorrow that would blight the to-morrow; we shall have lifted the curse that was placed upon man for forgetting his brother. By helping men to live the life of men we shall bring them nearer to Him whose children we are. That is our heritage, the only real one—that we are the children of God. With that backing, what is there that you and I cannot do? And how dare we refuse to do it?

When I was a girl I had a sweetheart, as most girls have, and that is when I first became interested in the growing of apples, as this particular sweet-

heart carried always with him a beautiful picture of a big, red Gano apple, and his discourses on this picture were varied and many. This same sweet-heart and I, after almost thirty years together along life's pleasant way, are still talking apples, not so much the Gano now as the Delicious, Golden Delicious, Jonathan, Grimes Golden and pedigreed Winesap—and especially the best methods of bringing these trees into bearing perfect fruit. Our studies along this line have been many as pertaining to heredity. I wish first to mention the citrus orchards of California. It is not a question of opinion, but a settled fact, that citrus trees in the same orchard of both oranges and lemons have superior and inferior fruit, and that in many orchards top grafting of these trees which bore inferior fruit has been practiced, and the results have been marvelous. The top-grafted inferior trees have become equal to the best trees in the orchard, both in productiveness and quality, showing that certain trees inherit superior traits of bearing, color and quality.

The same is true in the deciduous fruits. The constant growing of any variety of plants under favorable environment of soil, climate and good management will permanently fix the greater productiveness and higher quality of such species. On the other hand, the continuous growing or attempting to grow any species of plant life under unfavorable conditions of climate, soil, etc., for a long period of time will permanently fix the inferior quality of such. It is extremely important that we plant our orchards on the best soil and give them the closest attention.

Much of the unsatisfactory fruiting of orchards all over the country is due to self-sterility. A tree is self-sterile if it cannot set fruit unless planted near other varieties. The main cause of self-sterility is the inability of the pollen of a variety to fertilize the pistils of that variety. An indication of self-sterility is the continued dropping of young fruit from isolated trees or solid blocks of one variety. Cross-pollination probably gives better results than self-pollination with nearly all varieties.

It is advisable and practicable to plant all varieties of orchard fruits, be they self-sterile or self-fertile. James Sharpe grows the best Missouri Pippin apples in the state. The reason for this is that his orchards are grown from selected trees. I myself cut all the buds (my husband being ill at the time) from two trees selected from 1,000 by my husband. The bud variation of these trees had convinced him of their superiority in this orchard. You are all aware that the Gano is a bud variation of the Ben Davis. These two trees bore finer fruit than any of the other thousand. Professor Dickens unhesitatingly says they are a superior strain or variety. Our young orchard of 100 acres is composed almost entirely of trees grafted with scions from selected trees. The trees are also planted with a view to cross-pollination, as nature abhors self-pollination in both animal and vegetable kingdoms. This is a subject requiring much study, as certain varieties are not susceptible to the pollen of certain other varieties, and to learn the varieties the pollen of which is congenial to each other is an important study. There are many other things I might mention about growing apples which we have learned in the hard school of experience, which is sometimes an expensive but always

a valuable school. Through it all we have loved the work, even when I was a lassie and Jimmy was a laddie, when—

The maple trees were tinged with red,
The birch with golden yellow,
And high above the orchard walls
Hung apples rich and mellow.
And that's the way, through the orchard lane
That looked so still and grassy,
The way I took on Sunday eve
When Jimmy was a laddie.

You may think that patient face
Looks somewhat thin and faded,
But to me it is the very sweetest one
That apple tree e'er shaded.
But when we first went through yon lane
That looked so sweet and grassy
Those eyes were bright, those cheeks were red,
When Jimmy was a laddie.

And so you see I've grown to love
The wrinkles more than roses—
Earth's winter flowers are sweeter far
Than all spring's dewy posies.
They'll carry us some day through yonder lane
That looks so still and grassy,
Adown the orchard lane we loved to go
When Jimmy was a laddie.

ADVANTAGES OF EXHIBITING AT FAIRS.

A. L. SPONSLER, Secretary, Kansas State Fair, Hutchinson, Kan.

Fairs are exhibitions in the modern sense of the word. The old use of the word "fair" was that of a place whereat goods, merchandise and chattel property of any and all kinds were exposed and offered for sale. In order to get the proper idea in the minds of the general public the Canadian government has popularized the name "exhibition," and that is the designation or title all educational institutions of that kind in that country are given. In America we call them fairs, having a rather definite understanding of their use and scope.

A fair is an exposition of things so arranged and displayed that like may be compared with like for the purpose of comparison. I cannot refrain from saying here what I have said heretofore to other meetings similar to this. To get down to the real fundamental analysis and meaning of a modern educational fair we always land on the word "comparison."

The principles lying at the base of the fairs and expositions of this country are as nearly eternal as are the basic principles of our jurisprudence. From time immemorial progress has been made by comparison. All mankind in all ages has progressed by the use of the mental faculty of comparison. Comparison is one of the greatest words in language—and no language exists without that word or a word which expresses a like meaning. The comparative faculty of the human mind "is that power of the intellect by which, from knowledge acquired and conserved, the mind forms general conceptions and

applies them in judgment and reasoning"; it is the rational faculty, otherwise expressed by the word "thought." Comparison is termed by some authorities as the "elaborate faculty" and by others as the "thought faculty." Philosophical writers treat conception as comparison of objects; judgment the comparison of conceptions; and reasoning the comparison of judgment. The comparative method used in the sciences has produced comparative anatomy, comparative philology, comparative ethnology, comparative physiology, etc. Our common schools and institutions of higher learning, however, teach mostly by the use of abstract and abstruse methods. Fairs and expositions teach by the use of object lessons—by the use of concrete forms, individual examples, all actual, visual things. The visitor seeing these objects properly classified and arranged conceives them, judges them and reasons upon them. The good derived therefrom depends upon the mental capacity of the observer; but whether that mental capacity is great or small, more can be learned and more wholesome ideas originated, impressed and lodged than can be gained by any other method. The sense of comparison is one of the first noted in the unfolding development of the child, and continues his principal faculty to his dotage. Consequently it is a scientific fact that the object lessons of the fair are productive of education, even though the visitor be unconscious of the fact that he is being educated. Thus the remark made by one of the most profound thinkers it has ever been my good fortune to meet, that "a great fair affords opportunity for a liberal education," impresses me more and more. It was for purposes of comparison that fairs were originated, and it will ever be so.

A few years ago I attended the Mid-West Apple Show at Des Moines. One of the most educational features of that show was an exhibit from an orchard near Council Bluffs. This orchard of about fifteen acres had been uncared for and virtually abandoned. It had ceased to produce fruit. Under the care of an expert it began to produce marketable fruit, and as many as 6,000 bushels of apples were gathered from it in a single year. The display showed the gnarly, unmarketable, practically useless sort of fruit this orchard had been bearing. (Such samples are not hard to find here and there in all communities where apple trees are growing.) It also showed the perfect fruit of several varieties. It was truly a great object lesson to all who saw it and comprehended its lesson. Every horticultural show has lessons valuable to producers of fruit whether they have been successful or unsuccessful.

Now that we understand the reason for the fair, the advantages to be obtained by exhibiting are obvious. No producer of any useful thing, whether it be from the home, the factory, the field, the feed lot, the apiary, the garden or the orchard, produces so well that he cannot learn more about producing the thing he regards as his best, and, with a feeling of pride in his accomplishment, exhibits at the fair. There he finds others just like himself with their exhibits. Each most carefully examines and studies the exhibits of all. When the awards are made the ones defeated have been given a lesson of great benefit to them in their future efforts. Frequently, and perhaps generally, those who have been defeated have profited most. There is much more to it than the mere exhibit; there is the conference and discussion which frequently results in the dissemination of more information than could have been accomplished in any other way. Many exhibitors enter their products at the fair,

not so much for the purpose of winning the prize offered as that they may compare theirs with others, the principal object being to learn. Again, no progressive citizen is interested in just his things or in just one class of things; so at the fair he sees spread before his vision in the various departments of the fair many, many things which are interesting, and he thereby becomes a better-informed man, more useful to himself and others. Right here many an exhibitor gains his greatest pleasure and profit, viz., that in making his exhibit he is performing a most useful service to his fellow citizens. There may be but few exhibitors in a certain department, as, for instance, the horticultural department. The good those few exhibitors do their community and their state is beyond estimate. The tens of thousands who see and familiarize themselves with these displays have had it made apparent to them what is possible to produce, and stimulates them in an effort to produce as good or better. A fine horticultural exhibit starts a train of thought in the minds of many, who otherwise would not have been impressed at all, with the manifold possibilities of horticultural production.

There is no excellence without great labor. This maxim is as true and applicable in horticulture as in any other line of endeavor. There is the planting and the pruning, the cultivating and the spraying; then the new pests, the late frosts and the droughts annoy and disappoint. At that, so far as care and culture are demanded, the fruit tree gives greater returns perennially than any other food plant.

Furthermore, there is a poetry in horticulture all its own, and it has been sung in the rhapsodies of our greatest *literati*. They have described the planting of the tree, the budding branches of springtime which burst into flowers of rich and rare perfume, fresh from the mystic shrine of Pomona, while singing birds and humming bees add life and animation to awakening nature. The red and ripened fruit of autumn as it bends the boughs of bounty is a picture that awakens the heart to thankfulness and inspires the artist to his utmost endeavors. All people from childhood to old age have had their hearts gladdened and their hopes aroused by these beautiful orchard scenes, by the written description in prose and poetry, and by the artist's brush. They are prepared for it all, and stand ready and waiting for the practical producer to show them how it is done. This is the service the successful orchardist performs when he exhibits choice specimens from his orchard to the multitudes as they gather by the side of the horticultural exhibition at the fair. He then stands the same as any other man who has produced anew or better than his fellows, whether it be from the field, the factory or any other pursuit—the value of his service is partly his, but much the greater part is gained by the public.

The man who produces exhibition fruit and does not show it at the fair "hides his light under a bushel." The fair manager says to him, "Let your light shine forth; you will not only give light to the world, but you will be benefited yourself by its reflected rays. It is the simple things you know that enlightens the public and it is the simple things you learn by showing and by coming in contact with others of your kind that adds to your own store of knowledge."

The producer of superior specimens of his mental and physical labor who does not show might be likened unto the captain of a ship who casts his

anchor to the keel of his own ship—when he goes down he carries his whole cargo with him to oblivion.

"All the world is a show, and we but the actors"; let each do well his part.

During the last biennium 43 entrymen made 312 entries in the horticultural department of the State Fair. Kansas needs much stimulation in horticultural work. We can grow practically all the fruit we require for home consumption, but we use millions of dollars' worth of foreign fruits annually. One of Kansas' greatest ailments from an economic standpoint is its use of products from other states which could and should be produced in our state. Even in pork products there are a number of counties that do not produce enough hogs to supply the home demand of these counties for pork, while the people of no county cures sufficient pork for its own consumption. These economies should be impressed upon the people of our state, and it is just such organizations as this that should devise ways and means to arouse our state to its derelictions and point the way to remove them. The greatest opportunity afforded is provided by the fairs of our state, and each county should see to it that a display of its products of horticulture is on display at the State Fair. What a wonderfully impressive show it would be if this were done. This Society might devise a way to do this. The law gives each and every county in this state the right to expend not over \$500 to place an exhibit at the State Fair. Your secretary is thoroughly alive to the situation and very efficient, but he needs the coöperation of the personnel of this Society to procure the exhibits. Every man who so engages himself and sees to it that exhibits are forthcoming for the county fairs and the State Fair will perform a most valuable service to his state. The managers of the State Fair will do their utmost to build the important industry you represent and are organized to foster. Let us all, therefore, exert our influence and activities to induce the people of our state to engage in greater horticultural activity for the common good of Kansas.

HORTICULTURE AT THE FAIRS.

A. L. BROOKE, Grantville, Kan.

It has become a hobby with me to claim that our agricultural fairs are not mere amusement features; they are important assets in the state, and I think a fair is one of the greatest educational institutions that we have to-day. I try to emphasize this fact in all the work that I do for the fair. I feel it a duty on my part to take an interest in this matter. We would not have very much of a fair and less of an exhibit in the horticultural department if we all refused to prepare and gather exhibits. The fact is that in most other departments of the fair interest is maintained from a selfish motive, because the men who make exhibits expect to get financial returns out of the exhibition by sales that he makes, and that is a good part of the fair also. Take the machinery exhibit; it is expected to reimburse the exhibitor by an increase in sales. You will remember, possibly, that a few years ago we had no exhibit of farm machinery. Why? Because the manufacturers decided not to go to the fairs to exhibit any more. They didn't come. They tried that for a year or two, but they have broken away from that now. They have

come back to the fair because they know that the fair is the place to show the people the best productions and latest improvements. Speaking on that proposition, I just want to say this: that the Kansas Free Fair, as you all know, has proven itself a success. It opens the free gates to the people, offers them an opportunity to see and learn what are the best agricultural products, the best improved machines and implements manufactured in the whole country.

I say it is the duty of every horticulturist to take an interest in our state fairs and help by furnishing exhibits. It is not altogether selfishness on my part or on anybody's to make exhibits regardless of the prizes won, because if you take an interest in the exhibits at these fairs you will naturally be repaid in what you learn in a horticultural way.

I believe that it is the duty of every good citizen of our state to be interested in agricultural fairs, for these agricultural fairs are great educational institutions. A horticulturist should be interested in horticultural exhibits from the fact that his products appeal to the better side of mankind, and are always beautiful to the eye as well as useful to the practical people.

Our Horticultural Society has been honored by having its secretary placed as a member of the Board of Managers of the Kansas State Fair. Our secretary, Brother Whitney, devotes much time, ability and labor to make our State Fair a success. I am connected with the Kansas Free Fair, having charge of the horticultural department, and we have very good displays of both fruit and flowers, and we urge all of our exhibitors to place their exhibits with the State Fair at Hutchinson, where, owing to the location, the horticultural exhibit is not as extensive as a state fair should have, and there have been times when the State Fair horticultural exhibit would have been small if Jefferson, Jackson and Shawnee counties had not furnished them several horticultural displays. It should be the earnest endeavor of all of our citizens to make our fairs, both the State and the Kansas Free Fair, the most complete fairs in the West. These fairs are made educational only through the energetic efforts of the citizens of Kansas.

It is well for us to exhibit our fruit at Hutchinson, that we may compare it with that grown in the Arkansas valley, and our own fruit does not lose any of its merits by the comparison. It is well that those valley orchardists can compare their fruit with ours. Let me close by urging all of you to boost the horticultural and floral exhibits for our fairs. There is no other exhibit at any fair that will attract the attention that does the fruit and flowers. May I ask Brother Bolmar to say something about his wonderful peach.

DISCUSSION.

C. P. BOLMAR: I have what I consider a very wonderful peach for Kansas. In 1894 I received from W. M. Anderson the seed of three different varieties of peaches that grew in northern Indiana along the south shore of Lake Michigan. From this seed I reproduced two varieties; one a white cling, which from its great saccharine content I have named Honey Cling; the other, in deference to its origin, I have named Hoosier Free. I have had from those trees twenty-five crops of peaches in the last twenty-six years. The trees have been subjected to a temperature of twenty-six degrees below zero, and only once have I had a total failure, and that was in 1919. I have a

quantity of seed I am sending to tell that we may have this luscious fruit peach having proved hardy enough twenty-six chances, and proved its best should be classed as a valuable acquisition.

A MEMBER: Do you water your peaches in Kansas?

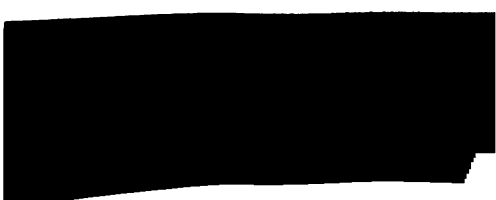
C. P. BOLMAR: Never at all. Just every spring around the base of the tree fruited this year for the third time, and of that fruit which measured $13\frac{1}{2}$ inches.

A. L. BROOKE: That is well worth the trouble. I am glad that I have been instrumental in getting this peach to the people, and Mr. Bolmar has inquiries about it. I believe that if a horticulturist owes a duty to the state, it is to get out of his orchard. I believe that if a man has an obligation to perform to the public, it is to do it. That's the ground I take, and I believe it is a duty to perform to your state to the utmost of your skill and ability and to the public; so I do not believe it altogether of ours, or in any other state in the world. at the moral side of the obligation is to get it out. Have you something new, something to exhibit it to the country, show it to the people. I hope, Mr. Bolmar, that your Society, and I would like to see some one engaged in fruit growing and handling. The fruit, gets a little nearer to nature in the world. I think that is why I am interested in it. is because there is no profession that is so near to it. The farmer gets closer to it, and the city child.

GRAPES, PRODUCTION MARK

J. A. EASTRIDGE, Manager, Neosho

It is indeed a great pleasure to me to be able to do this for the great cause of fruit growing, and it is a pleasure to me. Grape growing is an industry that we have all forgotten. I have not heard of it here, and I want to say this to you—horticultural subjects that we have. I think from the day of Adam to the present time wisdom has made for man's use, and it is the way through. You can go over the



part of our grand and glorious country—Kansas, Missouri, Arkansas, Iowa, or any place in the East—and you will find varieties of the grape trying to climb high up on some tree, and now when we get down to the real facts, there is no crop that I know of that will give you the profit for the amount of labor and care taken that the grape will. A man can go into his vineyard and his work is all in front of him. You do not have to climb to top a tree that is diseased; all of your work is right there within four feet of the ground. And if it is properly cared for a vineyard should make you a pension for a lifetime. We have but very few grape diseases that will destroy our vines. Now, our methods in southwest Missouri are possibly different from those in use here in your great state of Kansas.

We have had experience from nine successive years in growing grapes. We have traveled to New York, to Iowa; we have been out West, and every place where the grape is grown in order to learn how the other fellow grows grapes. We were enthusiastic and intended to plant several varieties. We have come to the conclusion in our section of Missouri that the Concord, and possibly one or two others, are the desired varieties, and there are over 500 named varieties of grapes in this country.

Plant from seven to eight feet apart in the rows, and the rows ten feet apart. This gives ample room for the sprayer. The location for a vineyard should be on well-drained soil, with good air drainage and circulation. With these conditions you can successfully grow the Concord practically any place in the United States. It has been proven that this is a fact. First, if the ground will produce a good stalk of corn or a good crop of alfalfa it will produce a good bunch of grapes. And gentlemen and ladies, do you realize that out of the millions of people in this country to-day not half of them ever see a bunch of grapes. In the state of Kansas this year we sold seven carloads of grapes, and we had compliment after compliment on our fine product, and we are unable to supply the demand. Our grapes commence to ripen on the south side of Boston mountains in Arkansas and Missouri, and are off the market by the time the crop at Wathena is ready for the market. Then comes the grape of the East. Those vineyardists in Ohio, New York, Michigan and Connecticut have thousands of acres of grapes. The majority of the crop in the last three or four years has gone into grape juice. You remember only seven, eight or nine years ago you bought an eight-pound basket for eighteen, twenty or twenty-five cents. Those days are gone forever. The grape-juice industry and the eighteenth amendment have changed the condition, gentlemen, until to-day the California people, the people in the West, are sending to France for plants. The demand cannot be supplied at home. Mr. Welch, of the Welch Grape Juice Company, is erecting a \$450,000 plant in our country, and they are looking the United States over now for Concord plants. They not only make grape juice, but they also make marmalades and butters. After the juice is pressed from the grapes the pomace is utilized to the fullest extent. The demand for these by-products is greater than the supply. This section of Kansas can profitably produce grapes. Plant an acreage that will supply a marketing association. You must have sufficient acreage to sell in car lots. The individual vineyardist can only sell on a local market. Establish your vineyard on a location such as I have described. I am advising you from actual experience obtained at an expense of much time,

some money and plenty of worry. Plant the rows north and south. This gives you a good circulation of air, which is much needed to help controlling fungous diseases. The newly set plant must have a support as soon as it is about a foot high. This is best supplied by driving a stake at the side of the vine and training the vine to grow a straight, perpendicular stock. Permanent wires should be attached to strong posts, the first wire about twenty-eight inches from the ground and the second wire about eighteen inches above the first one. We spread the vine when it reaches the first wire, and make two shoulders. When the vine reaches the second wire you cut back your spur on each side for another year's wood. This plan will give you four canes of new wood. This system is easily explained to your help who are to do the pruning. By holding the wood back to this system which we have, you will get the vines in the condition that you want them. It may be accomplished in one year, or it may take three or four years. It is the nature of these vines to climb in the vineyard as well as to climb trees in their wild state. The vineyardist sometimes tries to produce a greater amount of fruit than the vitality of the vine will justify. This condition causes the vine to gather acid rather than sugar. Grapes produced under this condition are bitter to the taste and tend to pucker the mouth. The proper number of bunches with large berries of good quality will be much more profitable than more bunches with small berries of poor quality.

You must spray when black rot, mildew and other fungous diseases appear in the vineyard. We have had trouble with the grape-cane borer, which is a steel-blue bug about the size of a grain of wheat, which commences its work just as the bud begins to swell, and has ruined the crop in some vineyards by destroying all the fruit buds for that year, and frequently the fruit wood for the following year is badly damaged. A poison spray just before the bud opens will control this insect. Sometimes a second application must be applied. You must use fungicides for mildew, black rot and similar diseases. You must spray a vineyard, and it is easier to spray a vineyard than it is to spray an orchard. It is not a difficult undertaking, and the work is light as compared to orchard spraying.

This year we sold four carloads of grapes in Wichita. People came to where we were loading and receiving grapes, and said they did not know that there were such quantities and quality of grapes grown in Missouri. If you give people fruit of quality they get their dollar's worth. You give them poor fruit and it is worse than worthless and you have cheated the customer as well as yourself. We had all the trouble that any organization or individual could have when we came to sell our crop. The first year that our association tried to sell the grapes our manager lost about one-half of the shipments, and we never knew what became of them or where they went; neither did our manager. They were lost and that was all there was to it. We kept working and working, and this year we perfected our organization, or nearly perfected it, if you can call any organization perfect. The business men around the square of Neosho would not buy a basket of grapes from the grower. We insisted that our grapes must be ripe. Nothing is as bad as a grape that is cut while it is green. It will get black and look all right, but if you eat a bunch you will declare that you will never eat another one. We absolutely insist that a grape must be ripe before it is gathered.

We mark the net weight on each basket. When we sell a carload of those grapes we guarantee four and one-half pounds net weight and guarantee the grapes to be absolutely all right in every way, and this year we did not have a single complaint. It is impossible to sell your fruit without the commission man. We have some commission men who are not honest, but some are honest, and it is impossible to handle the fruit crop of the United States without them. How could I come to Topeka or any point in Kansas? You have to depend on these commission men for a market. It is impossible to sell without them; that is one part of the business. That line of business has developed because it was a necessity.

We are figuring on 2,000 cars of strawberries being shipped out of the Ozarks this year. What would we do with the strawberry crop without the commission men? The strawberry must be consumed within four or five days after it is picked. We could not sell to the consumer individually; we could not get to all of them. We sell a car to Mr. Anderson; he sells to the storekeepers in Topeka or ships to points around Topeka. For me to come to you direct would be an impossibility, and we have found that for our perishable fruit the very best organization we can get is the one that pays.

Grape growing is a profitable business. You big apple men think a vineyard is too small to fool with. That's where you are mistaken. I went out seven miles from Neosho some six or seven years ago and bought forty acres of land and paid \$800 for it. In the last five years I have taken between fifteen and eighteen thousand dollars' worth of fruit off that land. Such possibilities are right here in Kansas, all over Missouri, all over the country, and the people are demanding this fruit. They need fruit and enjoy it; give them good quality and they will eat it. Those people will eat fruit of good quality—strawberries, apples, grapes, and everything that you can produce. Give them something that is worth the price and they will pay for it. When they pay a dollar a quart for strawberries, give them good strawberries. I would rather sell a man one basket of good grapes at twice the price that I would two baskets of poor grapes. Green grapes are absolutely fit for nothing but jelly, and it is the same way with many of our apples.

We are situated differently from most sections. We sell Kansas all kinds of grapes. This year we had no trouble at all. One man west of Neosho marketed over 7,000 bushels of apples right there in his own yard to people, tourists, who hauled this fruit to Joplin, into Oklahoma and into districts where they haven't apples. We are well located for help and also as to a good market. There is Pittsburg, a coal-mining town northwest of us; Joplin north of us, a zinc-mining town; and Pitcher, Okla., south of us. They raise no fruit around those towns, and of course we have all the market we need. This next year I shall need from 150 to 175 strawberry pickers. It is a big game, gentlemen, and it takes study, and I certainly enjoy meeting men from all over the country who have made this a life study. You fruit men are the ones who make it possible to go around in any state and see the show cases full of nice apples or nice baskets of grapes. You are responsible for it, and it is an honor to know men of that kind. It is a work that keeps you perfectly clean and keeps you along the line of thought that is good for your country and for yourselves. You hardly ever find a real radical man that is a fruit man—ever notice that?

DISCUSSION.

PRESIDENT HOLSINGER: We ought to have some discussion now on this topic that has been presented by Mr. Eastridge. Grapes are certainly a profitable crop for Kansas and there ought to be more of them planted, and I am sure if more of them were planted there would be a lot of good, productive vineyards, because they come to maturity early and bear profitable crops for a long period of time. I know of a vineyard in our vicinity that has been there just as far back as I can remember. It was good then and would be now if it had not been neglected, but for thirty or forty years it produced well, and I do not know of any fruit plant that will last as long or bear so persistently as the grape.

GRAPES AND GRAPE CULTURE.

A. C. ESPENLAUB, Rosedale.

The grape is as old as man. I am much in favor of producing the grape because of its many good qualities and its sureness to produce a crop under almost every condition. A writer on the sugar-growing industry in Cuba scores a big argument for that very important plant when he says that the fields have to be planted only about every eight to twelve years, but I claim the grape has that eclipsed, as it only needs planting once in thirty to fifty years if properly cared for.

I once heard a very intelligent lady say in a meeting of this kind that "everyone has a hobby." I do not fully agree with her, but if she is right my hobby is the grape. I was reared on a fruit farm near Kansas City, Kan., and on this farm was one of the best vineyards in eastern Kansas. My father produced for the market several different kinds of fruit, but the one he depended on the most of all was the grape. As I remember, the vineyard always bore a crop; in fact, I can only recall one complete and one almost complete failure in more than thirty years, and each failure was caused by a freeze in May. On the ninth of May, 1906, when the fruit was the size of peas they were killed by a freeze, and the crop this year was frosted back three times after leafing out, and we had but a small yield.

This old home vineyard was noted for its productiveness and also for the many different bearing varieties it contained. My father was a real vineyardist and was more familiar with grapes than anyone that I ever knew. He liked to cultivate, to prune and care for the vines. When a new variety came out he was sure to secure a plant or two and try it out. At one time there were twenty-five or thirty separate and distinct bearing varieties in his vineyard, each one labeled and classified. There was the Concord, Moore's Early and Moore's Diamond, Catawba, Goethe, Cottage, Ives, Hartford, Clinton, Pocklington, Worden, Elvira, Martha, Niagara, a number of the Rogers, and many more I could mention. Those were in the days of the state, interstate and county fairs, and father used to take exhibits, and where he did he was almost sure to come away with many of the blue ribbons and a good part of the cash prizes.

The grape will stand more neglect and abuse after it is once thoroughly established than any other fruit I know, and it is a wonder to me that there is

a plot of ground from the fifty-foot lot to the farm of many acres without some kind of an arbor or vineyard on it. On the contrary, you can drive in your car for a day in almost any direction and see but very few grapevines. The reason you do not see grapes on almost every farm is not that people do not like the fruit, but from carelessness and a failure as good providers. I cannot remember of every knowing a person who did not like grapes.

In growing grapes there are two essentials; one is cultivation and the other is pruning, and I believe the more important of the two is pruning.

This is my theory why there are not more grapes on the farms. Almost every farm has had grapes planted at one time or another, but from lack of proper pruning the vines have disappeared. The average farmer plants, say, fifty or more grapevines and cultivates and prunes them for four or five years and gets them well established, until some unlucky winter he neglects to prune at the proper time, and when he starts pruning in the spring they bleed and he quits pruning, thinking he will injure the vines. The result is that when fall comes he finds instead of his vines having ten to fifteen pounds each they have twenty-five or thirty, and he thinks he has made a great discovery, namely, that the way to grow grapes is not to prune them. Well, next year he passes up the pruning again—it is so easy—but he does not get as much fruit as the year before; the bunches are smaller and they do not ripen evenly, and so on each year, he gets fewer and poorer grapes. When the vines are about played out he asks advice from some one who knows about grapes, and is told that the only way is to cut all the wood back to the main stalk, doing away with any chance for fruit for one season. This he refuses to do, so his vines go from bad to worse and soon his grape effort proves a failure, and he concludes it is cheaper to buy them than grow them; but when he has them priced from fifty to seventy-five cents per seven-pound basket he is not so sure. I am going to tell you a little further on how to cultivate and prune, not as an expert, but just as I handle them for home use and for profit.

If I had the unbounded confidence of this gathering and should offer to sell you a bond proposition and guarantee you 100 per cent return annually on the amount invested you would smother me trying to get me to take your money. I will not do that, but I will guarantee 100 per cent annually on grapes if you will plant them and care for them as I shall direct. The grape will give you 100 per cent return fourteen out of fifteen years, and it is safe to expect the fifteenth year you will get from 20 to 30 per cent return. Can you beat that!

SOIL AND LOCATION.

The first thing in planting grapes is the soil and location. Almost any soil will produce a fairly good grape, but the limestone and sandstone hill lands are the best. Some bottom lands are all right, but are more likely to be blighted by late frost. An east or southeast slope is best, as the morning sun dries the vines, and sloping ground is better than flat, that the waters from the excessive rains will drain off. Soil that will produce twenty-five or thirty bushels of corn to the acre is rich enough, as soil too rich in fertility stimulates a rank woody growth, which is to be avoided. Grapes do not thrive on wet ground. They do not like wet feet.

Address

Plow your ground in the
plow if possible, for if you
again for many years. I know
fifty years old and still producing
plantings.

GRAPE

Grape plants are grown
cutting should be about ten
lower cut should be made
upper about three-fourths of
bunch and buried in a well-rotted
planted in rows three and four
row. These cuttings should be
plants.

Mark your rows seven feet apart
the rows. The best success is
ground prepared and plants set
two in that month to plant
set the plants by line. The
inches. Spread the roots in
to two eyes, and when the roots
show. Place a strong stake
its place; tie the young shoot
plant plenty of the black
is limited. At the Kansas
grapes while he sells 10 bas

Grapes should be plowed
the spring, bar from the row
centers. After this keep the
similar tool and hoe once
enough to keep all weeds and
weeds and grass by early autumn
in the fall.

In pruning do the job as
before the sap commences to
best time. Leave from ten
thirty to forty eyes, starting
wire, or two feet above the

One very important feature
is summer pruning. The tips
inches long, commencing at
pruned for next year's bearing
past the last two or three buds



not show signs of fruit and all wild shoots below the ones left for next year's bearing wood. This early pruning of young shoots has a tendency to throw all the vigor into the fruit and leaves which remain on the shoot, that now will develop rapidly. This will be all that is needed until after blooming. When they have bloomed the laterals will have started from the axils of the leaves on the bearing shoots. Go over again and pinch these back to one leaf. This will have the tendency to develop this leaf very rapidly, making shade and protection for the fruit. The canes that were left unchecked, the ones for next year's bearing, are now about three feet long and should be pinched off near the end. This causes a strong, thrifty cane on which to produce fruit the following year.

INTERCROPPING.

The first year any kind of low growing crops may be planted between the rows, such as potatoes, sweet corn or tomatoes. I grow strawberries in mine and get about two good crops before the vines make shade sufficient to prevent a strong growth.

YIELD.

I consider a fair average yield from a vine is from fifteen to eighteen pounds. Sometimes they do better, and some few kinds bear more; but as a rule these big yields do not ripen well. Frequently vines are neglected in the matter of pruning, or too much wood is left, and then you get small bunches and poorly ripened berries, and this product we call jelly grapes. Anyone can raise this kind of stuff. But to produce good, fancy table grapes you have to work for them, and this work must be timely, both winter and summer.

PREPARING FOR MARKET.

Grapes should be marketed in small packages. Six- to seven-pound baskets are best. They should be handled with care, and all faulty, cracked and unripe berries removed from the bunches. The fruit should be placed in layers, and the top layer ought to be so placed that no stems show, making a smooth, packed surface of grapes, with purple, downy bloom showing. Appearance is a great factor in the marketing of grapes as well as other kinds of fruit.

PRICE.

The price of grapes varies. In 1918, 1919 and 1920 sixty to seventy-five cents was a common price for seven-pound baskets, but grape prices will come down with other things. Twenty-five to forty cents is a paying proposition.

DON'TS.

Don't ever plow, hoe or in any way cultivate the vineyard when the ground is wet. Sometimes when it is too wet to put up hay or plow corn an industrious farmer will work in his vineyard. Don't! for there is no surer way to get grape rot than this, and once you get rot it will cause you much trouble to get rid of it.

DISEASES.

The latest government reports show thirty distinct diseases of the grape, but very few of these are common to Kansas. Rot and mildew are the most common, and both are easily controlled by the Bordeaux spray.

SOME DETAILS OF GRAPE GROWING.

The growing of grapes is not a difficult problem and is one of the very practical fruit-growing industries that we have, being successful when some other lines of fruit industry have failed. The Concord grape is still holding its place as the standard variety in this state. It will produce bountifully under more conditions and different soils than any other variety that we have, and it is a grape that everybody inquires for just because they know that Concord is the name of the grape most generally grown in Kansas.

My experience and observation show very plainly that our people insist on buying a black grape, and it is a producer's business to produce that which is wanted by the buying public. Moore's Early is a very good variety for earliness and is quite a favorite with a number of vineyardists. Should you desire a variety of grapes for your own satisfaction and as a novelty, the Niagara for a white grape, Woodruff Red or the Little Delaware for a red grape, the Worden for a large black grape, are worthy of being tried. A few of these varieties placed in a row may interest yourself and visitors, and frequently you do have some calls for different varieties of grapes. The strong yearling plants are most generally selected by the successful vineyardist, although two-year-old vines are very good. Grapes were formerly planted with the rows closer together than they would be planted at this time. The fact that grapevines must be sprayed for best results compels the vineyardist to prepare for using a sprayer, and a power sprayer is to be preferred to a hand sprayer, although one can use a hand sprayer, even a knapsack sprayer, and for use in a small vineyard one frequently recommends a barrel sprayer; but when one contemplates planting over an acre one should have a power sprayer drawn by horses and operated by an engine.

At this time I would recommend planting the rows nine feet apart, with the vines in the row about eight feet apart, setting the plants ten or twelve inches deep. This number of plants, one year with another, will be about all that ordinary ground can furnish moisture and fertility for. A vineyard properly planted should last an ordinary lifetime, consequently you should have as nearly permanent posts as possible. If wood posts are used they should be treated with a creosote solution. The end posts should be extra heavy and firmly set in cement and braced from the second posts, which should also be firmly set. Wires should be taut and yet not overstretched, as the contraction of the metal when stretched too tight brings a great strain on the posts during cold weather. An ideal way is to have the wire well stretched and attached to a strong coil spring, which will give in cold weather and take up slack in hot weather.

I would advise planting these grapevines as nearly in a square as possible, staking them the first year with a strong stake, which will permit of cross-cultivation. This will be a great aid in keeping the ground free from weeds and inducing the roots to grow deeper, as one fault of the grape is frequently surface roots, which are detrimental to the growth of the plants during dry periods that are apt to come in Kansas. It is better to have one vine growing perpendicularly to about three feet. This should be trained on wire for the second year's growth; then encourage horizontal branches for the first wire; with the upright stalk continue to the second wire with more horizontal branches; thus bringing your grape into something like a fan shape.

The fruit is always produced on the wood growth of the previous year. This enables the vineyardist to practically produce the number of clusters of fruit to the vine that he desires, climatic conditions remaining normal. A little study of grape pruning will enable one to be a practical pruner of grapevines.

Any standard book on grape growing will give you many of the details, which are quite important. The success or failure of fruit enterprises often depends upon the close observation or neglect of details. The size of the wire is important. A small wire such as a telephone wire is apt to be so light that it will break, or if it does not break it is apt to injure the vine when there is a great weight to be supported by the tender vines. A large wire is to be preferred. Nos. 9 to 12 are about the desired sizes. I advise placing the posts every sixteen feet, and you could place them closer rather than farther apart. Endeavor to have the grapevine as near straight as possible. When there is a bend extending toward the center of the row it is very apt to be caught on the implement which is used in cultivating, and frequently the plant is pulled out by the roots or broken off.

Nitrogenous fertilizers are not the best for the grape as they are inclined to produce a surplus of wood growth. Summer pruning may be practiced if one is careful not to uncover green fruit to the direct rays of the sun, in which case the fruit would be badly sun-scalded.

At all times there should be a free circulation of air, not only in the rows, but underneath the vines. This will in a measure control fungous diseases. The grape here in Kansas at this time is not subjected to any great number of fungous diseases or insects. A lime-sulphur spray combined with an arsenical spray used about the time the buds are nicely started would be of much benefit. Later a Bordeaux spray when the fruit is well formed will in a measure prevent a fungous disease which blights the stem of the berry, which causes the wilt which destroys the fruit.

PRESERVATION OF UNFERMENTED FRUIT JUICE.

(SELECTED.)

APPLE JUICE. Select sound well-ripened fruit. Juice from green apples is dark colored and will not clear, while that from ripe fruit will give a bright, clear liquid. Put the juice into an enamel or glass vessel; put this into a larger vessel of water to protect it from the flame, and heat gradually to the required temperature, 185° F., for fifteen minutes. Remove all scum that forms during heating. After heating set the vessel aside, closely covered, for twenty-four hours. When ready to begin work the next day, first sterilize by boiling the bottles or jars to be used; then pour off the clear fruit juice into these bottles or jars and heat the second time to about 175° F. for thirty or forty minutes. For this second heating place a board in the bottom of a wash boiler; and after putting the jars on this, fill with water to within an inch of the top and heat gradually. Immediately after heating put on rubbers and caps for jars or press in the stoppers and seal. Jars may be easily sealed by inverting them and running paraffin under the edge of the top while the jar is hot. Cover the stoppers of bottles with either paraffin or sealing wax.

GRAPE JUICE. Use only clean, well-ripened fruit, and by selecting certain varieties almost any desired flavor may be obtained. Any device, as a cider press, may be used for crushing the fruit, or it may be crushed by hand. If a light-colored juice is desired place the crushed grapes in a stout bag and press out the juice or let it drip through. After the juice is obtained treat exactly as for apple juice. If a red juice is desired heat the crushed grapes and juice to 175° F., then strain out the juice and heat again for a few minutes to 180° F. Allow it to stand for twenty-four hours and treat as for the apple juice.

SOME PHASES OF THE APPLE-MARKETING PROBLEM IN KANSAS.

R. J. BARNETT, Professor of Horticulture, State Agricultural College, Manhattan, Kan.

In Kansas the distinction between general and special markets has become more clear-cut than in the majority of apple-growing regions. We have here the two distinct kinds of markets, and any discussion of the problems of disposing of the fruit at a profit must be based on a knowledge of the special requirements of each kind.

A special market is one on which the grower comes into close contact with the consumer of his fruit. He may sell at the farm gate, may peddle his product from a wagon or truck, or may sell to retailers in near-by towns or cities. At any rate, he is in close contact with the consumer, and if he is to retain his trade must satisfy the local demand with respect to varieties, quality, package, price and particular method of sale. As long as his market is not oversupplied with local fruit he reaps the advantage of the freight rate which shipped-in fruit must pay, and frequently saves the very considerable expense of fruit packages.

This is an extremely desirable form of marketing where possible to follow, and should be carefully fostered. In the nature of things, however, it carries a number of serious hazards. Growers so situated are likely to become careless as to the grade and keeping quality of the fruit supplied their customers, and thus make it easier for outside agencies to enter their market. This carelessness also results in the multiplication of the pests in their orchard, thereby adding to the cost of their control, and definitely shortens the bearing life of the trees.

Contrast with this the general market. For it the grower must be prepared to enter into direct competition with the growers of the whole country. His product must conform to the demands of the large city markets in both grade and pack, and he is as much or more interested in satisfying the desires of the middlemen, the jobbers and wholesalers as the demands of the final consumer, with whom he rarely ever comes in contact. What the New York, the Virginia and the Washington orchardists are doing and the crops they are producing is of immense importance to him. In short, his fruit goes into the general market and must there compete on the basis of its intrinsic value. Serious defects are likely to destroy the growers' hope of profit.

SOME FACTORS AFFECTING MARKETING.

1. **GENERAL PROSPERITY.** Professor Bailey states that even yet, and in a country as rich as the United States, fruit is looked on as a luxury by a large majority of the people. As long as this view is maintained fruit prices will be subject to variation due to changes in general business conditions. Under-consumption, not overproduction, develops during hard times, and fruit is difficult to sell even at a low price.

2. **TRANSPORTATION.** Failure to give close preliminary attention to the transportation question often leads otherwise cautious fruit growers into poor investments. When local markets are not available for all the fruit grown, adequate transportation at reasonable rates becomes a necessity. The ideal in this regard is either competition between rail and water routes or between two or more railroads.

Highway transportation is of almost as great importance. Especially for the soft fruits, good roads pay the fruit grower. Hauling by truck has been highly developed in some regions, and this year many cars of northwestern apples are going to New York and Liverpool by way of the Panama canal. Present railroad rates are a vital factor in the price of fruits. From the Northwest or from New York the car-lot rate is something over one dollar per hundredweight to Missouri river points. The relation of this to the prosperity of Kansas growers is easy to understand. However, competition by growers in near-by sections is likely to prove much more severe in years to come. Well-grown Missouri apples can be placed in Arkansas river valley points without prohibitive transportation charges.

3. **THE SIZE OF THE TOTAL AND THE LOCAL CROP.** Dispite the belief of some people held during the period just after the war, there is still a relation between supply, demand and price. Vary widely the supply or the demand and the price is sure to show a sympathetic variation. In the case of the total crop, however, local prices react less violently than do the prices in the centers of distribution, as Minneapolis, Chicago and Pittsburgh, but a fairly close parallel can be seen between local yields and local prices. The past shows that high prices cannot be expected during years of high yields.

Further, the wide fluctuations in yields tend to prevent economical co-operative selling. The establishing of sales agencies and channels is an expensive operation. Should the association go to this expense and then have no fruit to sell the next year, the cost of selling is greatly increased and the market is lost. Feast and famine years alike disrupt marketing arrangements. (Refers to charts showing yields and prices.)

4. **GRADE AND PACK OF FRUIT.** The relation between the marketing of fruit and the manner in which it is prepared for market is quite close. Wormy, overripe or infected fruit can sometimes be sold at a profit. Usually, however, the grower who produces such fruit does so at a twofold loss—loss in money, and eventually loss of his self-esteem. Fruit of low grade will generally sell for a low price and go to the by-product factories. Raising this fruit to a high-grade by proper practices of pruning, fertilizing, thinning and spraying is profitable, and is the difference between the good and the poor grower.

But little investigation is needed to discover that those states in which apple growing is most highly developed are the ones in which this matter of grade

and pack is most carefully regulated by well-enforced laws. California and the states of the Pacific Northwest, and New York, are examples. Missouri has made a start and has wisely left the details of their proposed grades to the state bureau of markets. Some such legislation is necessary in any producing state to protect the consumer and the good fruit grower.

Probably the best legislation does not specify the actual grade and pack, but places the making of such specifications in the hands of the state department of agriculture, after hearings to which the representations of the growers and the public are called.

Good fruit, grown at a reasonable cost, harvested at the correct time and in a careful manner and then properly prepared for market will yield the grower profits over a long period of time and make him wealthy indeed in his contemplation of a well-spent life.

DISCUSSION.

C. S. RITTER: I want to know whether or not the policy of such legislation should not be to encourage the grower of fruit for home use and home markets rather than for commercial purposes.

R. J. BARNETT: I feel sure that all horticulturists in the state interested in the matter should be encouraged to grow the home orchard, and it can be done without causing any loss to the commercial grower; but if you are a commercial grower and attempt to keep your orchard clean of diseases you should have some means of keeping your neighbor's orchard clean. I believe the farm or home orchard should be kept clean as well as the commercial orchard.

C. S. RITTER: A program such as that and rules and regulations governing same and the production of fruit should be in the hands of a society, but whether or not we could get the plan to take in other kinds of production as well, I do not know. Whether or not it would be a feasible plan to put the control under a set of rules and regulations prepared and administered by a state society I cannot say.

R. J. BARNETT: The grade and pack rules of the state of Washington are decided by a state commission of agriculture, which, in conference with delegates chosen by fruit growers of the state from their association, meets every year in Spokane and agrees on grade rules and pack rules for that year; then the state department of agriculture has the power to enforce those rules, and if the grower does not observe them he is treated as any other lawbreaker. If necessary they can go in and chop down a man's orchard if disease is present, or they can control it throughout the whole season and charge it against his taxes for next year. He can take care of his orchard or have it cut down. They are usually chopped against the man's will. I am sure that such rules should be formulated and enacted into law. I am sure they could be formulated and could be worked out here as well as in Washington.

C. S. RITTER: That sounds all right; but I am wondering whether or not we can extend the power of the men through legislation so that they could go into a man's orchard and cut down his trees that have been diseased.

F. W. DIXON: Two points I would like to bring out: First, we settled this years ago—ten or twelve years ago. There is no power scarcely that the Entomological Commission does not have. It can go into a man's orchard and cut down and make him pay for cutting down the trees. We have carried this

to the supreme court and settled the question once for all. We won that fight and it is ours. There is hardly any law governing disease in that way that we do not have. We have a case in the Arkansas valley right now where the man is paying for the treatment of scale in his orchard. The commission has the right to go into a man's orchard and cut down trees. Then one of our troubles is, as has been said, the man with the small orchard will not and does not take care of it. Too much trouble to spray; would have to use a hand pump; would rather buy his fruit, as he can get better than he is likely to raise. It is expensive to care for a small orchard as well as a large one, and he will not spend the money. As long as the farmer works more hours for less than other men, do not ask him to do more. Let him buy his fruit for his family. If his wife will raise a few chickens and get extra money it is easier than for the farmer to take care of even an acre orchard; so let him specialize on his farming, and not grow more fruit and perhaps start scale or some other disease that will injure a commercial orchard near by.

COÖPERATIVE MARKETING OF APPLES.

F. H. DILLENBACK, County Agent, Troy, Kan.

The movement to market apples coöperatively for the season of 1920 was started in Doniphan county because of several reasons. There had been successful coöperative organizations handling small fruits, and many believed that apples could be handled in this manner very satisfactorily. The market being weak this fall (1920), the idea of coöperative marketing was revived.

Because of financial and generally unsettled conditions many speculative buyers and purchasers of other years were unable and some declined to take the risk on the usual margin. Dealers were reluctant to buy unless they could make a quick turn, as they feared the apples might not be moved without a loss, and this attitude helped to force the price downward. Other very important factors in keeping prices down were the extremely large crop in many of the apple-producing centers and the foreign exchange rate, which discouraged exports, and in addition the increase in freight rates. There were many other reasons of greater or less weight tending to reduce prices, and all centering at picking time made the grower who had not disposed of his crop very uneasy as to how he would be able to sell at a fair price. In previous years the grower who did not sell his crop until picking time or nearly that late was frequently able to command a better price than he could have obtained earlier in the season. This condition many thought until nearly picking time would be repeated, when they discovered that buyers were only buying at low prices, and if they were to receive fair prices it would be necessary to locate a new market and locate it quickly. Storage was not available, and some were not able financially to hold their crop for any length of time, so they began to take stock and see what could be done and to discuss ways and means of relief.

About this time the annual state orchard tour was scheduled to arrive in Doniphan county, and as this was under the supervision of the county agent, he was looked to as a factor to help the growers select a practical plan that would help to move apples with a prospect of fair prices. Meetings were

called at the Farm Bureau office and various plans discussed and changed. It was thought that the State Farm Bureau could be of very material assistance in marketing, as marketing was one of the big problems to be solved by that organization. We decided to have the secretary meet with us. At this meeting plans were discussed and suggestions made by local growers and also growers from other sections of the state. During the tour it was decided to call a meeting for the following week to make some definite plans, and the extension specialist and the State Farm Bureau were asked to be present and assist us in locating a market. E. L. Rhoades and E. G. Kelly attended this meeting and made some suggestions. We decided to do what we could ourselves, as it looked as though we could not secure help from other sources in time to be of any material benefit. We determined quite closely the quantity of apples that would be available to be handled co-operatively. The growers signed an agreement pledging themselves to sell only through this association. We established grades; prices were decided on for the different grades and varieties. This information was sent to papers, farm bureaus, farmers' unions, and to individuals, stating what we had for sale, and prices. The *Kansas City Weekly Star* and other papers printed stories about what we were attempting to do. We received about 125 inquiries from 12 states, as follows: Kansas, Missouri, Oklahoma, Colorado, Iowa, Texas, Montana, South Dakota, Minnesota, Illinois, Nebraska, New Mexico, and almost without exception they referred to the article in the *Weekly Star*.

On checking up we found that we had at least 10,000 barrels of apples to sell, a large per cent of which were Ben Davis, which added to the selling problem. We also discovered that before we could get in position to move apples and to secure orders to handle any quantity that it was necessary to sell the Jonathan, as they were ready to move and we had no place to sell them and no place to store so that they could be held until the later varieties matured. So the bulk of the Jonathans were handled by local buyers. This was a very unfortunate condition for us, as they would have been a very valuable asset later in the season. Could we have held them we could have handled quite a number of orders that we were unable to fill on account of a lack of varieties. We also made another very grave mistake, and that was to require a deposit of one-half of the purchase price with the order. This was later corrected, but not until it had lost us the sale of a number of cars.

The time to pick other varieties was rapidly approaching, and not enough orders had been received to handle the crop, so it was decided to have the county agent go out over the state and see prospective customers and secure orders more rapidly. This was done, and the county agent spent a week on the road, selling several cars. Here another mistake was made, and that was the trip should have been made in an auto, as more territory could have been covered during the week, and we also overlooked one of our best markets by not thoroughly canvassing the adjoining counties until too late and they had placed their orders elsewhere.

By means of this association co-operating with the local farm bureau and the county agent we were able to handle twenty-four cars at a much better price than the growers otherwise would have been able to obtain, and we

helped the local market to quite an extent by taking that many off the market, and also by having another organization in the field handling part of the crop.

The expenses were not as high as might have been expected, and this was prorated according to the number of cars handled, and it only amounted to \$3.40 per car. Owing to conditions, this was considerable lower than an organization exclusively devoted to this work could be expected to handle them. On the other hand, a better organization exclusively devoted to this work could handle many more apples and still do so at a very nominal cost. We were fortunate in many ways, as we had but little trouble with cars being refused on arrival, or in disposing of them after this occurred. This could be improved materially in the future by more careful inspection while loading and by having a regular contract signed by both parties. We found only one party who was inclined to take advantage of us, and he did so because he knew that it would cost us more to force him to make adjustment than the amount involved, and we did not push the matter, as it would have increased expenses with a good chance of not collecting any more. Fortunately, we had but little difficulty along this line, and in the future we believe that we will have less.

We did not conduct this work according to the best business principles, as we took a number of chances that we should not have taken in order to do the things that we were attempting to do.

First, you must standardize the pack, and then be very careful to see that your pack comes up to the standard.

Second, adopt a trade-mark or brand and have it registered, so that when you speak of a certain brand of apples the buyer will know the brand. This will assist in the sale of the product, as it will not take long for your brand to become a standard for quality if you put out quality stuff. If your pack is poor the reputation of your brand will be poor and it will soon be very difficult to sell your brand at all.

Storage should be provided, as it would permit a longer selling period, and, if desired, it would also permit placing more varieties in a car. This would be advantageous to both parties and would very materially boost sales. Many buyers can handle mixed cars when it would be impracticable for them to attempt to handle a car of one variety. The producers can make their most desirable varieties sell the less desirable varieties, and in the aggregate a better price will be realized. Storage would also permit handling small orders to a much better advantage, and this with a little cultivation would amount to several cars a year, and it would also materially assist in advertising your products, and would likely during the course of a year bring carload orders for several extra cars.

An association should handle bulk, barreled and boxed apples, as part of the trade calls for each pack, and the seller must supply what the consumer wants if it expects to receive the trade. The association should hire an inspector at each loading point to assist in unloading and to inspect all the apples carefully at loading time, as this will save many complaints. If the inspector is hired by the association and is responsible to it he will be free to accept or reject according to the quality of the product offered, as the producer's idea of the quality of his apples is not always to be trusted.

A coöperative association can be of great help in marketing if it is efficiently organized and managed, but otherwise it will be of very doubtful value. It must conduct its business in a businesslike manner and stand back of the products it handles. One danger always facing such an organization will be a tendency to grow too fast and to try to handle more business than it is in a position to handle satisfactorily. Its sales organization must be able to care for all the products that it has to offer. It is much better to start on rather a small scale and grow slowly than to try to be too large on the start. The manager and board of directors must learn the business, and this takes time and experience, as each year new problems must be solved. We believe that an organization will live and grow so that eventually it will handle most of the apples produced in the county. A very close coöperation between the growers and the association is essential for the success of the association.

COÖPERATIVE APPLE MARKETING.

F. H. DILLENBACK, County Agent, Troy, Kan.

At the present time there is much interest in coöperative marketing of horticultural products. While this is not a new move, yet more interest is being manifested each year, as the producer is striving for larger returns and the consumer for a reduction in living costs, and there has been a gradual realization that there are too many agencies between that are and have been exacting too great a profit for the service rendered.

We believe that coöperative marketing is on a safer, sounder and more lasting basis than at any previous time. The farmers are gaining experience by previous mistakes along this line. The small returns received during the last year has forced a more careful study of all phases of farming, and the conclusion has been reached that marketing conditions have not received proper attention and that the producer and consumer must be placed in closer relations with each other, and that coöperative marketing offers an opportunity to shorten the distance. These same conditions apply to the apple industry as well as to other lines of farming, and it would seem that there is a real need for a large, active, efficient coöperative marketing organization in this Mid-West section of our country.

We have heard many times of the wonderful things the citrus-fruit growers and raisin growers have accomplished. Without detracting from their work in any way, we must realize that the apple growers here have many problems that are unknown to the citrus-fruit growers and raisin growers. We can learn much from them, yet we cannot pattern after them entirely, on account of varied conditions.

There are several essentials that a coöperative organization must have if it is to succeed in the work that it undertakes.

First. The organization must have absolute control of the selling of a definite amount of any product for a definite length of time. A binding contract must be signed and in possession of the company.

Second. A competent manager who knows the business and who is a firm believer in coöperative ventures. His pay should be in proportion to the amount of business transacted and his ability to deliver the goods. The asso-

ciation must make it worth his while to stay with it if he is satisfactory, as there is too great a risk in changing managers unless it is the last resort. Upon the manager and directors rest the success or failure of the venture.

Third. Every association must have definite, well-established grades and packs which the trade is familiar with and which will sell for the highest price. The producer in this state is just beginning to realize the value to him of an established trade-mark and a reputation for quality with the buying public. The association that departs from this high standard will exist but a limited time and it will do great damage in the region where it operates. Co-operative marketing means coöperation between the growers, coöperation between the consumers, and coöperation between both classes for the benefit of all.

There are two possible plans that may be used in selling. One would be to hire a manager to take entire charge of the business, and the other would be to pay a commission for selling to some one who is already engaged in handling apples. It is difficult to secure a competent man for the short time his services are required to market the apple crop.

In the matter of packing and grading we have much to learn from other sections, and we should begin at once to gain this knowledge and to put it into practice. We have seen a number of cars of apples shipped out and sold as orchard run that should have been made into cider. The shipper may have realized a small immediate profit on that car, but if he was a regular shipper this profit was consumed in finding another market for his later shipments, as it is necessary to locate for such shipments new markets every year, and this is expensive.

Every shipment should be of the grade and pack that has been agreed on. This will satisfy the purchaser, which will tend to sell more and more every year to the same customers with little or no expense for securing new trade. We believe that every association will find it to the advantage of all concerned to hire the packers and inspectors for every orchard, and these men to be responsible to the manager. In this manner the packs can be standardized reasonably well. The time is not far distant when the producer will haul to a central packing shed where this work can be done cheaper and better than by present methods. When this stage of progress is reached a coöperative company will be able to show results that will be equally satisfactory to the producer and consumer. High freight rates will likely prove a blessing in disguise, as they will prevent the shipment of a lot of inferior fruit that has been shipped in the past. A year ago while engaged in selling apples we found many prospective buyers who would not buy good fruit from Kansas orchards, as they did not believe that Kansas could produce as good apples as the Northwest. The reason for this is that Kansas growers have not given enough attention to packing and grading and because we have not given enough attention to cultivating our Kansas markets and the markets in our near-by states, and we hope this will soon be taken care of. We have been shipping our best apples to distant markets when they would have sold to better advantage at home.

One law that is needed is one that will establish standard grades and packs and require that every car or package be inspected and stamped before it can be shipped and that an inspection certificate be attached to every bill of lading. We protect the purchaser of nursery stock by requiring a certificate

of inspection showing that the shipment is apparently free from disease and providing a penalty for misrepresentation of kinds. Is not the purchaser of a car, box or barrel of apples entitled to the same protection? The unscrupulous growers and dealers must be made to stop their dishonest practices, as they are one of the worst parasites that the horticultural industry has to contend with at the present time. We do not often advocate legislation to cure evils, but in this instance it seems to be advisable to ask for this kind of a measure. Such a law would also serve as a guide for the man who desires to pack honestly but who does not know how to pack or grade properly.

Last year we assisted a number of growers to market coöperatively in a small way. We did not have a contract with them; it was more of a gentlemen's agreement, and unfortunately some did not live up to the agreement and some would not pay their share of the expense, and we could not force them to do so. We were also unfortunate in that the State Farm Bureau was not in a position to render us any material assistance, and the county farm bureau did not want to attempt to handle apples, especially when they were not sold under any inspection or recognized grades.

Since that time the state and county farm bureaus have had some experience handling apples and they are in a position now to render a real service to the growers and the consumers. Coöperative marketing of farm products is in its infancy in the Middle West, yet it is growing stronger every day. The time is not far distant when a large per cent of our farm products will be handled coöperatively. There are a number of difficulties to be overcome, but the man who is making a business of the production of apples is big enough to win if he has confidence in himself, his business and his fellowman.

COÖPERATIVE MARKETING.

JAMES C. JONES, Secretary Leavenworth Fruit and Truck Growers' Association.

The advantages of coöperative marketing of fruits and vegetables through the forming of associations by local growers have proved of such benefit to fruit growers and gardeners that only the known results of such organizations need be mentioned.

The best examples of coöperative marketing are the large associations of the West and Northwest, where every detail is systematized. Fertilization of the land; selection of the varieties that are most salable; sterilization of the seed to prevent fungous diseases; spraying to control insect injury; methods of applying water (where irrigation is practiced), as too much water causes insipid flavor and soft texture of fruit; gathering fruit and vegetables at the proper stage of maturity for distant shipment; curing and precooling of certain commodities before shipment; grading to insure quality; attractive packages; loading in a manner to obtain the best results of refrigeration and ventilation; advertising; marketing—are all under the management of experts.

The sales manager directs the movement of the produce through the assistance of brokers at the leading markets, who handles the association's brand only and who wires daily advice to sales managers. Shipments are so made that no point is overstocked, thus insuring a safer market.

Besides all of the advantages of cultivation and marketing, an important saving is made in buying the supplies needed by the members of the association. Crates and boxes are bought in carload lots and seeds are purchased at wholesale, the association charging only a small fee for handling. This is a saving for each member. These benefits can only be obtained through co-operation.

An association to be successful must have loyal members who will abide by the rules. Disloyal members who sell to competitors at a time when a commodity is scarce and in demand are detrimental to any association. Growers who ship independently where there is an association cause loss to themselves as well as to the organization.

The best customers are often dealers who handle only a limited quantity of each commodity. Where there are several independent shippers, very frequently they all make shipments to the same dealer. The result is that this dealer is overstocked, and as the goods are perishable, he must sacrifice to make sales. Thus to save a small commission charge to the association the independent shipper incurs a greater loss to himself.

The association manager strives to send only what the dealer can handle to advantage. He is always better informed than the independent shipper because of his larger acquaintance with the market conditions in the territory to which he is shipping.

To a producer an association membership inspires greater interest in his business through discussions and talks of officers and members of the organization. The member gains confidence in his work, knowing that through the efforts of the sales manager a larger quantity of his produce can be disposed of to advantage. In view of these facts, the low spot in the big field that is always too wet in the spring and too dry in the summer is tiled and put into cultivation, resulting in a larger food supply.

In regard to the benefit received by the fruit growers and gardeners around Leavenworth since our association was organized, I will say that I remember some years ago the growers would chase around early in the morning, each striving to reach a dealer ahead of a competitor. Often there would be two or three growers at the dealer's door when he opened for business, and in that case the dealer would buy part from each grower, almost at his own price. The grower would then hurry on to another store, meeting with almost the same result, and then finally take part of his load home. In the berry season this condition of affairs was very bad for the growers. The first man in was able to sell, but at a low price, because the dealer knew that another grower would be along soon, and he would not buy except at his own price. The grower who came later always had to take less than the early man, as the dealer had already bought a part of his needed supply. The result was that the dealer would begin to cut prices, and at ten o'clock one would see signs at a store, "Strawberries, three boxes for 25 cents." An hour later at another store a sign would read, "Strawberries, four boxes, 25 cents." By mid-afternoon berries could be bought at almost any price.

This has all been changed since our association was organized. Now the grower comes to town with his load in the afternoon in ample time to have his surplus stock shipped on the evening trains for the morning markets, where the sales manager has already secured orders. Now as the grower passes along

he stops at the stores and offers his produce at the market price, and if the dealer does not want the goods at that price the grower, if he is a member of the association, drives to the depot, where the secretary gives him a receipt for what he leaves. In this way the home market is kept steady and I have heard dealers say they are better satisfied with present conditions, because they know that other dealers could not have bought cheaper and so would not cut the price.

So far our association has only handled small fruit and vegetables. Only a limited amount of tree fruit has been handled to date. It may be that we will take up the marketing of orchard and field vegetable crops in the near future. Our members number fifty growers, including the officers of the association, all of whom are also growers. We use two or three carloads of packages each season and ship from seven to fifteen carloads of produce by freight and from ten to fifteen thousand packages by express, besides supplying the home trade. Our shipments bring in to the members of the association around \$15,000 annually.

In conclusion I will say that a marketing association to be successful must have loyal members; a staff of officers of business ability; and as the financial success of the association depends almost entirely upon the sales manager, choose an experienced and capable man for this position, pay him a salary or commission that will bring forth his best effort, give him full authority as to marketing, aid him by earliness of crops and a quality pack, so that his efforts for the prosperity of the association will be assured.

FARM BUREAU BENEFITS FOR THE HORTICULTURISTS.

CHARLES R. WEEKS, Secretary, Kansas Farm Bureau, Manhattan, Kan.

The State Farm Bureau can do what you want it to do—it can run its machinery to help another kindred organization along with its special work. I believe we are all convinced that the community organization is to be the basis—market commodity basis. The State Farm Bureau, organized as it is, covering as many counties as it does and covering as many states as it does, with a county agent to look after production and other work within the country, with an organization in each county that is organized for the benefit of all, it is possible that we could find some way whereby this organization could help your organization and all other organizations of this kind. In fact, just yesterday we organized the Wool Growers' Association of Kansas. At the beginning of this there were called meetings of all those who pooled wool, first at Topeka, and those that pooled in the southwestern part of the state at Wichita, and at Parsons—three meetings. One man was appointed from the meeting at Topeka to meet with men appointed at the Wichita and Parsons meetings, to determine what should be done with the clip this year, and these men recommended that we call a meeting, which was called here yesterday and an organization perfected to handle wool marketing for this state. This organization will coöperate with similar organizations in other states. I wish to say a word about this organization; it is my idea of a marketing organization for fruit growers. Of course there is another type of organization known as the Rochdale plan; a small amount of capital stock from each mem-

ber, capital stock bearing a small rate of interest. They do business on this capital stock and pay back all the proceeds above expenses, prorated to each member according to the amount of produce delivered and the amount of goods he bought from the cooperative store. There is the California plan that you have heard so much about. That is a proposition of signing up so many growers of a commodity, then organizing on the basis that these growers deliver all of their surplus to selling organizations for from three to five years. Title passes when goods are delivered to the selling association, and the selling organization functions just as an independent selling organization. This organization or selling association is handled by specialists along that line, whatever the commodity is, and is hired and fired by a board of directors composed of producing members of the association. This has reached its highest stage of perfection in the Raisin Growers' Association, which absolutely fixes the price of raisins, and has done so during the last several years. It has made contracts with the distributors and filled in the price a few months later, when it was ascertained what the price would be. This association has been attacked by the antitrust laws and certain rulings made that this company will have to live up to in order to stay in that business. These plans are not adapted to marketing apples in Kansas. These men who met yesterday have worked out a good system of marketing. It is said that farmers never get together unless they are in trouble, unless they are pinched somewhere, and then we get together in an organization and get an organizer to act as an official squealer for us. We are right now in a period when we must organize to get results. Cost of production has increased rapidly, so that now a slight change in the market may mean a considerable amount in financial loss. We cannot take the chance of letting some one else handle the business for us without our having any stabilized idea of what we are going to have for our product. We must organize.

The farmer must realize this principle; that he is a producer and not necessarily an expert marketer, and when he enters the marketing game he must secure expert salesmen; he must employ those people and maintain the control of them through his own board, but his marketing must go on through men who know marketing and make it their special line. That has been demonstrated in the Fruit Growers' Association of California. They paid as a salary to the best raisin grower in the state the amount that he said was his profit during the past season, and he has made a remarkable success of it. Now, is there any question of what the State Farm Bureau could do? Let me ask you this question: The State Farm Bureau is a state organization with units in various counties. The State Farm Bureau is in position to help, when help is asked for, in any way it can help. The State Farm Bureau does not want to dominate, dictate or force organization on any group of people. I take it, that is what you asked me to come here and talk about. We are in the field to help in an educational way. You know this—that all commercial enterprises have very efficient organizations. Take, for instance, the packers: They have their packers' institute. These organizations are promoting business. I believe that the time is ripe for something along this marketing line in the marketing of apples in our state. County agents are writing to the State Farm Bureau office asking for information as to where they could get carloads of apples. I believe there were other county agents asking where they could

dispose of apples, and at the same time apples were being shipped into this state from Oregon, Washington and from other better-organized states. The apple counties of Kansas, which grow better apples than we import, with an efficient sales organization could profitably market every Kansas-grown apple to the citizens of Kansas. It would reduce the cost to consumers as well as increase the profits of the producer. Michigan apples came here during the time that you had a glut of apples in the market. They came from Colorado and western states, simply because those states are organized to find a market.

The county agent is the vital element in the local community. He is there, and is paid by the taxpayers to help the farmers, and the biggest help we need right now is efficient marketing plans. We can raise the products, but we are failing to market them at cost of production plus a fair profit. Everybody has recognized that principle in the past. Railroads are now being given six per cent on their investments. Their investments they claim were twenty billion dollars. Clifford Thorne, in the employ of the American Farm Bureau, found that their real valuation is only eight billion dollars, and they ask for twenty billions; and this was reduced through his efforts, which will save to the producers a hundred million dollars a year in freight.

You farmers are producing the food of the world, as you did through the war, yet you are not guaranteed any per cent of profit, not even the cost of production. It is not possible for us, even through organization, to assure ourselves every year cost of production plus a fair profit, because we have all grades of producers. If your market is stabilized and you have a more direct way to get to the market, and you know your business is handled by yourselves in an efficient way, your business will become profitable and the share of loss will be no more than the share of loss sustained in other lines of business.

The only way you will ever get anywhere in the marketing of your products or the handling of your business or handling of your legislative matters is to pay the bill yourself and do it through your own organization. Now, we have tried to have other people attend to our business for us, and they are busy attending to their own. If you apple growers perfect an organization you will have to do it yourselves, finance it yourselves, and hire and fire your own specialists. Whether you will do that on a community basis, county basis or state basis I do not know. There can be a better system of marketing arranged if we go after it and try for it.

Organizations handling perishable commodities usually find a market for their offerings before the products are ready for that market. Could we be in that kind of a position? Could these cars of perishable apples be marketed on contract before they are harvested? That's a problem that the association would have to work out. I do not know whether you could do it the way the raisin growers do or not. But another thing that we are up against all the time is that the farmers do not have the facts about their business, do not know the facts about the markets of the world. Isn't that a fact? You should have an organization to get this information for you. That is another place where the American Farm Bureau can help. I do not know exactly how the ultimate price would be fixed unless it could be fixed by competition. Of course you are limiting competition when you distribute the commodity as it is needed, aren't you? As it is now one market is glutted and we rush to another market that is not glutted.

DISCUSSION.

W. A. S. BIRD: You called attention to marketing apples before they are harvested. Do you believe through the service of the Farm Bureau it would be possible to ascertain how many carloads of apples could be disposed of, say, in Saline county? Could your county agent in Saline county advise the county agent in Doniphan county about how many carloads of apples could be disposed of in that county?

CHARLES R. WEEKS: Yes, that would be possible; but the question in my mind is whether you would not have to have an organization with a manager who is a real business manager to look after it. The county agent is a busy man and there are a great many things he has to do, and he might not be a marketing specialist. You should have some centralized organization to determine where the shipments should be sent.

THE FARM BUREAU AS A MARKETING AGENCY FOR FARM PRODUCTS.

RALPH SNYDER, President State Farm Bureau, Manhattan, Kan.

The Farm Bureau of Kansas is primarily a service organization. It has no ambition to become a dominant factor as a marketing agency. Its function is rather to assist those now in existence or to build other farmer marketing organizations. There are now in existence a number of marketing agencies in the state, more or less successful, and it is undoubtedly better to build on these and with these than try to upset all existing conditions or try to build anew.

There are two fundamental principles which we recognize in an organized marketing of farm products: first, coöperation; and second, commodity. That we must come to the coöperative marketing of our products is generally conceded, and I think well established by the experience of those who have given it a thorough trial. The fact that other industries so closely allied to ours have been so well organized and work so well as units really makes it imperative that we follow this lead and do likewise.

The fact that employers of labor in times past became so closely associated and understood each other so well made it imperative that labor organize as a matter of self-protection. Now the fact that both industry and labor, being the buyers of our product, are so well organized makes it imperative that we do likewise. Being composed of something like seven million units in the United States, it seems that the only practical solution is coöperative selling, that we may in some way act as a unit against the larger buying units as they exist at this time. That we may best accomplish our purpose it is found by experience that we must organize on a commodity basis. The selling of apples is quite a different thing than the selling of hay or corn, wheat or live stock. It requires different machinery, different methods, and is altogether a different line of work. Perhaps the most notable example of this is to be found in California. It is said they have in that state at least fourteen different successful commodity coöperative marketing organizations. As indications of this success it is estimated that they get forty-nine cents of the consumer's dollar against thirty-eight cents secured by the average producer in the United

States. Thirty per cent added to our net returns is certainly well worth looking after.

The State Farm Bureau has done comparatively little directly in a marketing way. It has been our policy so far to confine ourselves to marketing products as between farmer and farmer or between coöperative organizations. On account of the fruit-crop failure in Kansas, the past year we made arrangements with an Idaho fruit growers' organization and bought for our members some twenty-five cars of apples. We chose to buy from Idaho because of the stringent grading laws of that state. An inspection sheet goes with each car, stating definitely just what the car does contain, the percentage of defects, size, quality, etc. In no case did we find any complaint. I think there is one point we may well look into—our standard of grades. If this is to be a successful fruit-growing state and establish a good market for its products, we must establish definite grades and provide methods for having them lived up to. The Farm Bureau stands ready to assist the State Horticultural Society at all times in this sort of a program. We are preparing to use this same marketing machinery this coming year in distributing the bountiful fruit crop we hope to have in the fruit sections of the state to other less-favored sections where fruit cannot be successfully produced.

I want to take this opportunity to assure this Society of our most hearty support, not only in this marketing of the fruit crop of our state, but in a better, larger and more economic production.

CONTINUED ACTIVITIES OF THE WELBORN COMMUNITY MARKET FOR 1920.

J. M. BUTLER, Kansas City, Kan.

I have not had time to prepare a paper on this subject, but I will just state a few facts. We started in 1917 without capital, and organized as the Welborn Market Association in May, 1918. We sold some stock and our authorized capital was \$5,000. We bought a piece of ground, approximately one acre, and put up a shed 98 feet long, that we could have two rows of wagons. I have not the figures for 1918, but in 1919 we collected about \$900 market fees and \$129 stall rent. This year, 1920, we had about \$171 stall rent and \$861 market fees. Our market fee this year was not so large on account of the Easter freeze, which killed quite a lot of the early fruit, but comparing August this year with August last year, our marketing fee in August last year was \$309 and this year \$325. I believe you can see that if things had been normal we would have had greater receipts. We handled about the same amount of baskets and crates this year that we did last year, but our basket and crate business was done early this year, earlier than last year, because we had more capital with which to handle it. Last year we handled nearly \$600 worth of spray material, and I am satisfied that we will handle quite a lot more of it this year. We ought to have more activities for the wintertime than we have. Without having a central distributing place it is hard to get people to ride out when it is cold weather. They will come out any time the weather is pleasant. People wish to get outdoors for both business and recreation. Recreation really is first, but if they can buy some really fresh produce they will avail

themselves of the opportunity. If we could get more organizations similar to the Welborn market and get them around each of the large cities, that we might have a central distributing point for our products the year round, it would be much better for us. Our opening season is about the latter part of May, anywhere from the 25th of May to the first of June, when cherries and strawberries begin to arrive in sufficient quantities to move to market, and it continues on as long as we have pleasant weather. August is our big month.

It is hard for me to tell just a few of you anything about the Welborn market. I would like to have each one of you people come down and see the Welborn market about 6 p. m. during August.

DISCUSSION.

PRESIDENT HOLSINGER: Mr. Butler, tell them how far this market is from the main part of Kansas City, Kan.

MR. BUTLER: Approximately six miles from the courthouse of Kansas City, Kan. We are on the old government road, the Leavenworth road. It is the rock road that leads out of Kansas City, Kan. We are two miles west from the end of the Quindaro street-car line, and I have been told that for about an hour in the evening from the end of the Quindaro line out past Welborn and back to the end of the Minnesota avenue line, or Eighteenth and Minnesota avenue, a distance of about six miles, you could toss a ball from one car to another that entire distance for a space of about an hour's time. There are enough people at our market for us to sell from ten to twenty gallons of ice cream each evening just in cones. You know there are a lot of people who visit our market. There will be anywhere from thirty to seventy-five wagons on good nights. We have had several rainy nights this past season, and we do not have much produce on those evenings, but the people who come to sell on rainy nights are really in earnest and want to sell, and the grocerymen and hucksters who come there rainy nights are really in earnest and actually need to buy the produce. The groceryman will buy more produce in rainy weather than he will in nice weather, because he knows he will not have the competition of the hucksters. The huckster is a good-weather buyer and the grocer is a liberal buyer in bad weather.

A. L. BROOKE: Have you any data as to the distance from which your customers come?

J. M. BUTLER: When I collect the market fee I ask the name and note the number of the stall. The purchasers come from as great a distance as fourteen miles. There is one party who sold in the last three seasons about 200 bushels of Jonathan apples which he hauled from Ransom. Some of those who sell on our market are from the Kaw river valley, but only a few from that distance. The regulars are from close at hand to as far away as eight miles. Most of the regular patrons are within a radius of two or three miles. We are west of Kansas City, Kan., but I believe fifty, or possibly sixty or sixty-five per cent of the tags on the automobiles are from Missouri. They come from the Country Club and as far as Swope Park, and some I have talked to come from Independence, but that is only one occasionally. We have regular customers that come from the Country Club, a distance of about fifteen miles, from one to three evenings a week.

A. L. BROOKE: I am much interested in that community market. Mr.

Addresses, Paper

Butler has made the greatest practice in the state of Kansas. Could we sustain near a city the size of Topeka?

J. M. BUTLER: I do not know very conditions being similar here to what you think you could probably have there. You could at least have one, if you could. I believe we ought to accumulate the community in which these local markets come from a central distributing place, within a country and six months a year in fresh goods, and they would like to go to the farm. It is surprising, the people here is a little taint or a little something is not about farm products. I am retail members, and the customers claim the pork and the butcher shop's product.

When we first started the market I was born thought that it might be a good or two evenings a week, or maybe that many people came through curiosity that we could not run just two or three every-night proposition. Now, I will say nights we have more offerings than we are getting larger all the time. They are a lot of people who work all through noons and Sundays, but they will put in a day; so Saturday evening markets have been successful.

PRESIDENT HOLSINGER: One great thing is that it works well both ways—works fine to the farmers and the people of the city who are anxious to

CONTINUED ACTIVITIES OF THE SOCIETY FOR RURAL MARKETING

J. M. BUTLER,

During the past several years I have been born community market to this Society's experiment in rural marketing, making and wondering, like my hearers, just what would come out at all. I am here to tell you that it is an assured institution, as firmly established as any business that we have.

The initial success of the market was a fluke based upon unnatural war between high and consumers were driven to great distance to get produce at all? We

these questions beyond doubt. The principles upon which the market is founded are sound and apply to normal as well as abnormal times.

The idea of driving into the country for fresh produce is growing each year. The increase in motor cars and good roads is adding to the movement. People desire to get away, combine business and pleasure, and purchase supplies before they pass through the deterioration incident to handling by middlemen. They want, and will always want, freshness and quality such as can be supplied at a producers'-consumers' market such as ours.

We have lived through a hard year, but the difficulty has not been the lack of patronage. We had more buyers than produce to sell, and these patrons came of their own accord. We dared not advertise, for at no time could we secure produce in variety and quantity that would warrant the crowds that would have answered a special appeal. We are largely a fruit-growing community and this season was well-nigh disastrous to that industry; yet we moved steadily forward with good crowds, depending largely upon the vegetable trade, supplying our patrons with staple farm needs, and actually coming out of the season with a present worth greater than last season. Despite the unfavorable season nearly 3,000 wagonloads of produce were sold at the market.

There is no doubt about the volume of business we can attract provided we give the service to justify it. That is our chief concern as we face the future. How can we give the largest service to the community? Our first problem came with the realization that we had outgrown our quarters. If the crop that was promised early in the spring had matured there would have been no room for many of the wagons that would have come to the market during the summer. It seemed that we dare not face a new season without more space. The first stock issue of \$5,000 had been largely absorbed in the purchase and equipment of the original site. The stockholders voted unanimously to increase the capitalization to \$10,000 and acquire adjacent property. At a meeting on the evening of December 17 over \$1,000 of this stock was subscribed in a few moments, assuring the directors adequate funds to begin needed enlargements. The par value of the stock is \$25. It is now selling at \$30. Obviously, in a year of decided business retrenchment, particularly in rural districts, the Welborn market is not retrenching.

The market not only intends to handle more wagons, attract more patrons and sell more produce next season than ever before, but we are seeking other ways of increasing our service. We are entering actively into a campaign for better grading. We expect to teach every producer that his best customers are his repeaters. We are urging every farmer to have a permanent stall where his customers can find him. We will have a record of every man on every stall every night. If produce is unsatisfactory we want both parties to the transaction to know that the market will have the data to go to the bottom of the matter. It will give a sense of assurance to one and a sense of responsibility to the other. We are urging every farmer to do some individual advertising. We urge each man to sell his produce under his own name, and we wish him to feel that his name must be a trade-mark for excellence.

The Welborn market must stand for quality to justify its right to live. It already has competitors, as two near-by communities have established rural markets modeled closely after ours, and if we do not please our customers

some one else will. We intend to enlarge our facilities for buying in quantity the supplies the farmers need, such as baskets and crates, spray materials and machinery and general hardware. We believe concerted buying is to be one of the greatest economies to farmers in general, and we are going to push it to the utmost.

We shall also be active in the labor situation this season. Wyandotte county does not produce nearly the quantity of small fruit that the markets justify, largely because sufficient labor has not been available and the farmers have tried to solve the labor problem each for himself. We will urge the berry growers to list their needs with us, and we will insert advertisements daily in the Kansas City papers stating how many pickers are needed in the community. There is much available labor in Kansas City, and we believe we can be the means to connect it to the need of the small-fruit growers.

There is also work ahead in the educational field. We are coöperating actively with the farm bureau, and plan to have experts in different lines meet under the combined auspices of the Welborn community market and the county farm bureau. We made a good beginning this year when Mr. Whitney spoke on "Coöperative Marketing." Our community is widely diversified in its interests, and we can be of incalculable service by bringing in experts in fruit and vegetable growing, in poultry and dairying, to speak to us during the winter months. One of the most important crops any community can raise is ideas, and we expect to deal in ideas as well as produce at the Welborn market.

You may think I am talking on a great many things beside marketing, and we are thinking of many things besides marketing at Welborn. A rural market is, with us, an established fact. If we have a favorable season we shall be taxed to the uttermost, even with our enlarged facilities, to handle the patrons that are certain to come. I repeat that there is no limit to the amount of business that we can do if the season gives us good crops and we grade and advertise accordingly. We have awakened to the fact that we are a many-sided institution, touching the life of our community at many points. We must provide more than a place to market produce. Farm communities in general have no centralization point around which to rally, no means of real coöperation and of expressing themselves adequately, or of attracting to themselves many of the privileges that many other classes of our citizens enjoy. It is this larger service of organization and of education that we are trying to give to the Welborn community market. If an institution has real service to render the public will make a beaten track to its doorway. We sell berries and beans, peaches and peas, cantaloupes and cabbage, spuds and apples at Welborn; but, most of all, we aim to sell service—service to the customers, who demand fair measure and good quality without exorbitant profit to the middleman; and service to overworked farmers, who are saved many a weary mile on the road to market through having the city come virtually to the producer's doorway for that which is for sale.

DISCUSSION.

A MEMBER: How do you set the price?

J. M. BUTLER: Well, each fellow has been setting his own. There has been a wide variance in price and also in quality. The Kansas City market is usually used as a criterion. Generally, I will say, the price is just a small per

cent under the Missouri market price. Supply and demand has much to do with the price.

W. B. VINING: Is there any difference in the berries furnished at your market than in Kansas City?

J. M. BUTLER: I have seen berries come into the Welborn market in good shape, and if not sold taken on to the Kansas City market, but not in such good shape. If the men do not get at our market the price they ask, they frequently take them to Kansas City. I have seen them come into the Welborn market in good shape in the evening, and then if not sold taken into Kansas City for the morning market.

RALPH SNYDER: It occurred to me that at times the supply might be too great and result disastrously to the seller. Have you ever considered a price commission or something like that. Would it be feasible?

J. M. BUTLER: We have taken that under consideration; but we find that, being so close to a big market, it is hard to get people into an association to carry such a proposition through. They seem to think they ought to get a certain price, and bring their goods to the Welborn market, and if they do not get it they will take the produce on to the Missouri market. I do not believe a coöperative association could be formed there so near to the larger market. It may come sometime.

NATIONAL MARKETING OF FRUIT.

E. A. IKENBERRY, Independence, Mo.

Mr. President, Members of the State Horticultural Society and Fellow Fruit Growers: As a member of the Missouri Horticultural Society, I wish to bring greetings to the members of the Kansas State Horticultural Society.

I feel that the people of Missouri have many things in common with the people of Kansas. Generally speaking, I believe that our climatic conditions are about the same, our soil conditions are generally the same. They vary, of course, with the community, as they do within a given state or given county. Also our varieties of fruit are practically the same and our markets are the same. I hope that our people are that same type that were so eloquently described last night by Doctor Lawson. I believe that Missouri horticulturists have the same big vision of service to their fellow men that the horticulturists of Kansas and the horticulturists of the United States have. With this big vision I believe there are two thoughts that come to all of us in connection with the marketing of our fruit products which we are interested in. The first, I would say, is that all fruit men are interested in putting on the markets of the United States fruit in such a manner and at such a price that every man, woman and child living in America can enjoy this fruit product which we enjoy in producing; and second, I believe that the fruit producers, because of their risk, because of their capital invested, because of the long period of time necessary to bring an orchard into a profitable condition, are entitled to realize the cost of production plus a reasonable profit.

Of course, years like the past year we are willing to take our risk with other interests of the world, and as a class, to ask no special favors. But when we consider the question of marketing fruit efficiently, one of the first things to

consider is the price—a remunerative price. Orchardists have differed on the subject of price, but it is impossible for us to get away from the price subject. As a fruit producer and as a student of the market conditions, I am a firm believer in the old law of “supply and demand.” But I recognize the fact that there are some unnecessary speculations, and that because of the failure to have at our disposal the most accurate figures on the supply, the real work of the law of “supply and demand” is not true in its whole sense; but let that be as it may, the price is determined in a general way by the law of “supply and demand.” Now, when we take up the study of the national marketing of fruit, let me say that I believe it is the most complex problem of any when applied to fruit—much more than when applied to other food commodities. I do not know whether Mr. Snyder would agree with me in regard to that when he thinks of marketing wheat. He has been working with that subject for the last few months and has done some good work along that line. But fruit commodities are perishable and must be disposed of and must be cared for without delay. For these reasons I believe it makes the fruit-marketing problem one of the most complex that we have.

The late war has impressed upon us many things, but one which I think we all agree upon is that it has taught us that one of the old sayings is still true and must be taken into consideration even to-day. It is that question asked many years ago, “Am I my brother’s keeper?” I believe we fruit men have come to recognize the fact that we are not living as individuals. Farmers have recognized the fact that they are not living unto themselves. We used to think we were the most independent people on earth because we were farmers. Nations also recognized that fact. And I have had brought to my mind very forcibly in the last few months the fact that we apple men in the central part of the United States are also “our brother’s keeper,” and that we too are not living unto ourselves in the apple industry. I believe we have a relationship with the producers of all kinds of fruit in all sections of the United States.

Sitting as a member of the committee of twenty-one, the National Fruit Marketing Committee, which is to take up the study and deal with marketing of all kinds of fruit, has made me feel that the people who are the producers of apples in the central part of the United States have perhaps lost sight of the fact that there are many other kinds of fruit commodities which we should be interested in, and which, directly or indirectly, as you please to put it, influence the marketing of such commodity. I was agreeably pleased yesterday with the outline on the relationship of the price of apples and the supply of apples in the United States; and I was impressed with the fact, as was said, that the local supply had more to do with the price than the national supply had to do with the local price. It leads me to believe that these other fruit commodities that are produced in different parts of the United States probably play a small part, and yet I do believe they play a certain part, in the price and the supply and demand of the fruit commodity which we produce in this section.

Now I judge that you folks are especially interested in a national marketing committee rather than a general discussion of the subject of national marketing, and personally, when I accepted the invitation to come and talk on

"National Marketing of Fruit" I accepted the invitation not because I had some great message for you people on the national marketing of fruit, but because I felt that you people here in Kansas perhaps have had a lot of experience and have some such problems as we have in Missouri, and also because of my position on the committee. Living in this territory, I felt that I needed to know your views and your problems and your desires in order that I might act more wisely upon the committee, and I came here not to talk to you people so much as to open the discussion and to have you folks talk to me and to Mr. Farnsworth and others in order that we might get more definitely your opinion of some things we might do in regard to the national marketing of fruit.

Some of you probably wonder just how this committee was appointed, and I wish to explain it very briefly. On the recommendation of a number of fruit growers, President Howard of the National Farm Bureau called a meeting for April 5 at Chicago. This meeting was composed of representatives of various states, and some thirty-five states were represented and over one hundred delegates were there, and as a result of that day's conference President Howard of the American Farm Bureau was asked to appoint a committee of fruit men, not to exceed twenty-one in number, whose business it would be to take up and study the problem of national marketing of fruit, and work out, if possible, some plan, and present that plan to President Howard and back to the various states for final ratification. The committee was appointed, and I want to say to you folks that so far as I am personally concerned my appointment upon this committee came to me unsolicited. I have long had an interest in trying to do something that was worth while for the people that I served as county agent, and am now serving as a citizen of the community. I was glad to accept the appointment on the committee, and expect to do all I can to bring about something that will be worth while for the industry.

I shall just take a few more minutes of your time to tell you the names of the men on the committee. That may be a waste of time, but I feel that you men should know personally just as much as possible the men who are to wrestle with the problem of marketing fruit in this country. Mr. Farnsworth you heard yesterday. You know something of his interest and work and realize that he is doing something worth while.

J. S. Edwards, East Highlands, Cal., is director of the California Citrus Fruit Growers' Association. I wish you people might have had the pleasure of sitting in conference at Atlanta, Ga., with him and heard him discuss some of the questions pertinent to fruit men. He is young and active of mind, though an elderly man, and he has had a great experience. He is one of the most successful orange growers in the west.

W. B. Armstrong, president of the Washington Farm Bureau Federation, Yakima, Wash., has had a great experience in business as well as in farm work. He is especially interested in some of the problems that are before this committee of twenty-one.

Mr. Gray Silver, chairman of the legislative work at Washington, is a fruit grower of West Virginia and has done much in connection with the local work there.

Addresses, Pap

C. I. Lewis, of Oregon, director a
Coöperative Association, has writt
Grower and other papers.

W. S. Keeline, Council Bluffs, Io

W. B. Hunter, president Georgia

A. E. Johnson, Grand Junction, C

Orland Harrison, Berlin, Md.

Charles E. Hardy, Hollis, N. H.,

C. B. Lewis, Riverton, N. J.

Dr. O. E. Winberg, Silverhill, Ala.
and president of the Southern Fruit

C. E. Stewart, director and manag
Fla.

W. H. Stites, Henderson, Ky.

N. R. Peet, Rochester, N. Y., ch
of western New York, has organized

Sheridan W. Baker, Santa Rosa,

C. E. Durst, Illinois Agricultural

M. B. Goff, Sturgeon Bay, Wis.

Prof. Laurenz Greene, Purdue Un

B. F. Moomaw, Cloverdale, Va., f
of Virginia.

James Nichel, president of Michi

Samuel Adams, editor of *America*

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fore this committee. I hope you fo
send to me any communication on a
before this national committee.

We expect to take up the study
and in order to do that efficiently we
smaller ones and assigned to each
until our next meeting, and at that
bring in a report and we could then
to present these committees, not in

kind of committees we appointed and say just a few words about the lines of work that are to be considered by them. I do not know all about the various committees, but I will sketch some of them briefly.

The interrelationship committee deals with relationship between the associations that now exist in the United States on the marketing of fruit and the associations that are to be formed in the various parts of the United States. It is only fair that we should have the experience of men who have had experience in working on these problems, and I think it was rather fortunate that a number of men appearing on the committee were men who have had experience in the West and some in the southern and eastern states in coöperative marketing. This committee, in my judgment, must consider one of the very great problems during the next few weeks and report to the next conference. That problem is the relationship that exists between the marketing associations that are now in existence and those that are to be formed.

The second committee is on publicity. You know sometimes I feel that the producer of apples in the Middle West has been getting along without giving a great deal of attention to the subject of supply. We are all interested in the supply; but I feel, fellow fruit growers, that we have been students selfishly on the subject of demand. As long as the demand is greater than the supply we might do that; but I believe there is a great field, not for the apple grower alone, but for the fruit growers of all sections of the United States to work upon the subject of demand. No manufacturer who succeeds in his business is satisfied unless he can increase the demand for his product, and the men who are growers of fruit should give some careful consideration to the subject of demand for fruit. Mr. Farnsworth has said that certain people have increased the demand for fruit several times by an advertising campaign, and I want to say to you that I think it is time that the fruit interests were getting busy on the advertising of fruit, not as a luxury, but as a necessity in the diet. I say that job is part of the job of the producers—to supply fruit and to advertise it. Just one thought on this: Any metropolitan paper you may pick up has an advertisement on the value of milk as a food, milk as a necessity in the baby's diet. Will you read that week after week and then say to me it does not increase the demand? We know it does. The same kind of national advertising of fruit as valuable food is something we should be interested in. There are a number of ways in which advertising of fruit as a food could be brought to public attention, and that is the purpose of the committee on publicity.

The third committee is that on transportation and freight rates. We people in the Middle West, located in a community where we are not producing the amount of fruit that we are consuming, should be interested in freight rates. Right here I want to say that we should consider the foreign market as well as the home. I believe the fruit producers in the United States must be interested in the export trade of fruit. I believe we recognize the fact this year, with only a very small acreage of the United States producing fruit, that the apparent glut on the market, or oversupply of the market, was very largely due to our export conditions. That indicates other problems to be studied. I believe, with the great prospect that we have for fruit this next year, that right now is the time the American fruit growers should be interested in export trade.

You see there are many problems. We must consider standard grades. Mr. Farnsworth is on this committee to tell you about it. Here comes the one we shall pack, pure fruit juices, native estimated, but it is almost true that it sends the individual who packed the side. We need a grading law, so that variety coming from any section of some kind of a law to protect us. I report a few days ago that the amount was 32,000,000 gallons, and in 1919, 100,000,000 gallons—more than a fifty per cent partly because of the slump in the price in price of fruit, making it more profitable; partly by the prohibition law putting various drinks onto the market under which are adulterations. We should who buys these so-called fruit juice same might be said of dried fruit and

Finance committee: The finance committee has been able to work out a definite budget committee and putting into operation out of the work. By the time of the committees report, the finance committee definite budget, and at that time they be called upon to help finance the work not represented on this committee, I think organizations and various individuals work. We are not worrying much something that is worth while, and the States to help. We feel confident that

The executive committee, I think

This, in brief, puts the matter before the edge of the objects that we are working to have your local men discuss the their views. I want to say that the growers of the United States and the indebted to the National Farm Bureau knowledge they have already gotten to us, and this will be of great assistance has put aside from its funds a sum who can give his time and energy might be of use to this committee.

DISCUSS

R. J. BARNETT: I am deeply interested more attention to the export trade,

SECRETARY WHITNEY: I should like

GEORGE W. KINKEAD: I am here

I am at a loss to know just what to say, because I understand the committee is young and just being organized. I want you to know that Doniphan county will be willing to help anything of this nature. We have shipped as many as 800 cars of apples from our little city of Troy, and sometimes it is a problem to know how to distribute them. We have sold them in various ways—to the jobber and to the county distributing agents, and sometimes divided them. We have had to wrestle with this problem several times. I have been very much interested in Mr. Ikenberry's talk. I am glad to hear that there is a movement of this kind initiated.

F. W. DIXON: I think the fruit growers of Kansas are all in sympathy with this movement. I am sure it is a big field for the fruit growers. I am certainly much interested in Mr. Ikenberry's remarks. Certainly no mistake was made when he was put on this committee. I know the committee has a big job before it. Of course they are just organizing, and I am sure the fruit growers of Kansas will help them out. The farmer is one who does little thinking for himself; you "have to show him," as though he was from Mr. Ikenberry's state. I will be interested in knowing how the finance committee gets on. People always want to know what they will get out of a thing before they put anything in. If you do not put something in, how can you get anything out? I am in sympathy with this movement.

W. B. VINING: I feel that this is a fruit state as well as a corn and wheat state. When the price of corn went down we all suffered. The elevators issued warehouse receipts to the farmers so that they might get a little money for current expenses. Will that be provided for on this national committee—that is, will it be fixed so we can get a little advance to tide us over?

E. A. IKENBERRY: At this time I am not able to answer that question, but I am certain it is one of the problems that will come before us at the next meeting; it is one of the great problems confronting us. We all realize the necessity of an organization for efficient marketing of our fruit. So often when fruit has been plentiful the markets have been flooded and the price forced down, when as a matter of fact if it had been properly distributed this would not have happened. It was unfortunate for all concerned, whether they had apples on the market or not at that particular time. That is one of the factors that we must take care of.

F. W. DIXON: Has anything been done along the line of standardization of grading and packing?

E. A. IKENBERRY: There has been a special subcommittee appointed to take up the question of standardization of grading and packing. Mr. Farnsworth is on that committee, and perhaps he can tell you something of what has been done.

W. G. FARNSWORTH: As a member of that subcommittee I will say we have had no meeting, but expect to have one soon to draft something to present to the committee of twenty-one at its next meeting. Each member of that committee realizes the necessity of having some standards both in packing and grading. At the present time fruit growers have no language to express the kind of fruit they have for market: Grade No. 1 from one man may be a very different grade from No. 1 sent by another man. When the standard is set by the board the federal grade or federal pack will mean the same thing at all times. We will then have an established standard, which will

benefit not only the producer but the consumer as well. The plans will not be of any value unless they are suited to people in general and not to individuals. I was certainly highly pleased with the feeling the committee had for the public in general. They seemed to lay aside entirely their own selfish views and considered the question from the broad view of the entire country. We must work together with that broad view. We must work together and all cooperate if we get anywhere in this work. The committee will try to work out something for the grading and packing that will aid everybody.

A. L. BROOKE: That is all right. It is one thing to standardize, but in addition there should be provision made that it should not be violated. As it is now, even when commodities are marked with the government tag, it means nothing. Often the tags are put on fraudulently or by some one with no authority.

W. G. FARNSWORTH: There will have to be some arrangement made for federal inspection, and though I have no authority to say it, as the committee has taken no action, I think there will be something worked out along that line. I think it will be a more simple matter to trace back to headquarters than at present.

A MEMBER: The committee should not lose sight of the container. The public has a right to a square deal in quantity as well as quality.

GEO. W. KINKAD: In the Northwest they use boxes almost exclusively; also in the central West. Is the old barrel system of packing apples becoming obsolete? There is a market for barreled apples. If we must resort to boxes for apples it will make a change for us, as we are not educated along that line and we must educate our people in that way of packing. There is a demand for boxed apples, and the demand for barreled apples is less than it used to be.

W. G. FARNSWORTH: That is a very important point. In our own section I think they are barreled. I know the basket apples are selling at a better price than the boxed apples. We are selling baskets provided the baskets carry the same quality and grade that the western boxed apples do. We get fifty to seventy-five cents more per bushel in the Toledo and Columbus markets than for western boxed apples. I believe if the same grade of apples is put in the barrels that the western men put in the boxes, that the barreled fruit will not be considered a low grade. I think the committee will not specifically decide on the pack, as to whether it shall be barrel, box or basket. It will say what grade they shall contain. In Boston a bushel box contains five pecks. Another feature I think will be considered is that of content, as to number of cubic inches. We are all aware that a bushel of Ben Davis or of Jonathan or of Winesap does not give you the same value. I think the content of boxes or baskets will be based on the cubic inches contained therein.

A. L. BROOKE: I am of the opinion that the basket is the cheapest container there is; also the handiest. It is about the best way to ship apples there is; they can be stacked, and the basket is easily handled. It is better than either the barrel or the box. The price of barrels is almost prohibitive. The barrels I used to get for 35 and 40 cents are now priced at \$1.70.

W. G. FARNSWORTH: It is a question in my mind as to whether the law governing the size of the package and the grade should be made compulsory

or optional under federal law. I mean by that, whether it should be made optional with the grower to pack his fruit under the federal law and subject to federal inspection and be permitted to put on the federal brand; or whether we should let him pack under the federal law and not use the federal brand, but his own individual brand. If the individual brand could be held to such a standard that it would mean the same high grade as the federal brand it would be worth considering.

F. W. DIXON: Would that apply to bulk apples as well as graded apples?

W. G. FARNSWORTH: Yes; I think so. Apples are all apples. I doubt if it is wise to specify whether we use a box, barrel or basket. If we specify a box the chances are that box apples will advance. If we give the choice of container the grower can use whichever is best fitted to his conditions, but that pack should contain the same number of cubic inches. This has been done in the case of berries; we have different sized boxes, and the buyer knows by looking at them how much he is getting.

W. B. VINING: In a commercial pack, with all No. 1 in one pack and all No. 2 in another, if they are not stamped by the packer when first sent out, and then the buyer sells the No. 2 for No. 1, who is responsible? We sell in lots—send them out, and then our apples are resold.

PROFESSOR DICKENS: Mr. Vining, do you stamp them with your name?

W. B. VINING: No.

PROFESSOR DICKENS: There, I think, is one difficulty. Every pack should be marked with the name of the packer as well as the owner of the apples. In that way it could be traced back to the responsible party who did the packing. If that principle is maintained as to each party who has anything to do with the apples it can be traced either way for information, for frauds or good points. Even the grower would know which of his help was not packing as he should.

SOME NEWER APPLE WRINKLES.

R. J. BARNETT, Manhattan, Kan.

Kansas has a record in the production of horticulturists and horticultural crops of which no state would be ashamed and which excites the envy of many. Scores of her native or adopted sons have gained nation-wide fame as progressive thinkers and doers along pomological lines. Our H. E. Van Deman was for many years the leading fruit judge of the United States. Our Dr. Joseph Stayman produced one of the best varieties of apples known to mankind. Our Prof. F. C. Sears is the author of two of the most valuable books yet published on the subject of fruit growing. A Kansas man, S. C. Mason, is to-day the country's leading authority on the date. Instances might be multiplied by the hundred, including prominent growers, plant breeders, professional pomologists, and fruit-loving amateurs.

With such a heritage to stimulate our ambitions and direct us toward higher ideals in our art, it would indeed be strange were we of this day to fall away from the standards thus set and prove content to rest on past laurels instead of advancing toward the production of not only more fruit, but of fruit of vastly higher quality than much of that found in our Kansas markets to-day.

Better fruit should be our aim, and better fruit will do two very important things for the grower; it will put more money into his pocketbook and it will enable him to gaze into the looking-glass without a blush of shame for having debased one of nature's best gifts to man.

As a brief elaboration of the first of these advantages of growing high-quality fruit, note these points: Recent years have been exceptional in that the buying ability of the people of the United States has been far above the average, hence dealers in first-class barreled and boxed apples have not been forced to push sales outside of the larger centers. Costs of producing fruit in the Northeast and Northwest have been abnormally high—up to \$1.30 a box in Washington—but when costs become normal these orchardists can, due to their high acre yields, which frequently reach 1,000 bushels, compete with the Kansas grower in his own home town. Poorly grown and carelessly harvested apples must be disposed of very soon after they are picked, or they will lose the premium which usually follows even a brief period of storage. Orchards in which first-grade fruit is produced live and remain productive many years longer than those less carefully cared for. The easiest money a fruit grower makes is that which is added to his profits through the expenditure of money. Many of us miss the fine satisfaction which follows the production and placing on the market of a first-grade product, and we cannot help but lose pride in our industry when its fruits are defective or decayed. It is my purpose, then, to call attention to some of the newer developments in orcharding through which more and better fruit can be produced and profitably marketed.

MAINTENANCE OF ORCHARD SOIL FERTILITY.

Many papers have been presented before this Society in which the demands made on the soil by the fruit plants were set forth and methods for replacing this loss were elaborated. Some of the principles underlying this subject may be briefly recapitulated. The soil of each orchard presents a separate individual problem in its proper management and fertilization, and this holds as a general rule: all orchards deplete the fertility of the soil on which they grow, and the great majority of them will yield returns on the investment in the maintenance or even positive improvement of this fertility. Intercropping in itself never improves the orchard soil, and may greatly deplete it. An intimate relation exists between the fertility of the soil and the ability of the tree to withstand drought, though by no means to the extent that the plant food supply can be increased to a point which will enable the tree to exist without moisture. The basic principle here should be "fertilize for profit."

The most economical ways in which fertilizing for profit may be done will vary in different parts of the state. Barnyard manure may be available, and is usually most valuable, because it improves both the physical condition and the chemical composition of the soil. The amount needed will be between five and twenty tons to the acre each year, the richness of the manure as well as the sterility of the soil being factors in determining this matter. Commercial fertilizers are sometimes indicated, but very rarely is it good business to buy and apply what are known as "complete fertilizers" of this type. Study of the trees and fruit and some experimental applications will usually disclose which of the elements of plant food has become the limiting factor and must be applied to stimulate the trees to new activity. Cover crops, as distinct from

intercrops, may serve as conservers of the natural fertility of the soil, and in case they belong to the legume group, actually increase the total supply of nitrogenous compounds in it.

Experimental work to determine the best plants to grow in our orchards as cover crops and the best methods for the culture of these crops in Kansas orchards are badly needed. A perfectly good conundrum is, When is a cover crop not a cover crop? And the answer is, When it is cut and removed from orchard land. It then becomes an intercrop, and usually harms instead of helping the orchard. Let us fertilize.

CODLING-MOTH CONTROL.

Among the insect pests of the apple the codling moth ranks first in injury done throughout the country. It is found every place where apples or pears are produced on a commercial scale and costs the growers millions of dollars in the loss of fruit and expense in control measures each year. It is a veritable old man of the sea about the neck of every apple grower. It is worse than fungous diseases, worse than scale; in fact, nothing is worse than a worm in a good dessert apple, unless it be more worms.

If we are to grow good apples we must control this pest. If we attempt to control it, economy should prompt us to use those methods and materials which have been found to be most efficient. The best poison should be used. Our present state of knowledge indicates that arsenate of lead, powder or paste form, is such best poison. It has many points of superiority over Paris green. Experience indicates that the first, or calyx, codling-moth spray is the most important of all the applications. Should it score a hundred per cent efficient throughout the community, no other spray would be needed that season. The correct application of this spray demands high pressure—200 pounds; a driving spray such as only a nozzle of the Bordeaux or clipper type can give; that the direction of the spray be downward. Subsequent cover sprays are of the same material, but may be applied with some other type of nozzle. They are cover sprays.

Further life-history studies of the codling moth should be made in the orchards of the various pomological districts of Kansas, as our present knowledge of this matter is insufficient to enable us to do the most efficient control work.

A brief statement of what some other sections of the country are trying to do about this pest might be of interest here. In the Northwest, Oregon and Idaho are meeting with only moderate success in their control measures. This is also the case in some parts of Washington, but the larger apple-producing sections such as the Yakima and Wenatchee valleys have records of only two per cent infestation. This is secured by careful application of the known methods of control. Certain localities in Washington and the province of British Columbia have changed their system of attack on this pest within the past few years and now follow eradication rather than control methods. One illustration in British Columbia may be cited.

The Okanogan valley in that province contains 4,000 acres of apple orchards. As no pest which requires spraying except the codling moth has been introduced, the growers do not possess spray rigs. Whenever the provincial inspectors discover an infested area it is placed under quarantine and eradica-

tion methods are instituted. During my visit to this section last summer 200 acres were under such quarantine and 60 acres were almost ready for release, no infested apples having been found during the last two seasons.

After the survey is made and the limits of the area to be placed under quarantine are determined, the provincial horticulturist takes full charge and organizes the campaign of eradication. This campaign is started by the immediate banding of all of the trees with burlap and obtaining spray outfits and materials. All the spraying is supervised by provincial experts, the dates being determined by life-history studies made in each orchard. The cost is divided between the owner and the province, and for complete eradication averages \$200 an acre.

During the life of the quarantine every apple produced in the area is inspected and all infested ones are immediately destroyed. This applies even to such fruit as the grower may wish to store for home use. No apples or used apple containers may be brought into the district. All refrigerator or other cars in which apples or pears have been shipped must be thoroughly disinfected by the railroad companies before being placed on any sidetrack in the valley. Automobile tourists have been convicted of starting one or two infestations.

THINNING THE APPLE.

Professor Sears, himself a commercial apple grower, states in "Productive Orchardling": "No other one thing will so change the size and appearance of a crop of apples as the simple operation of removing about half of them from the trees." Fred G. Carlisle, an extensive commercial grower, writing for *The Apple Annual*, says: "We have heard a great deal about pruning, spraying and cultivating and fertilizing, but very little about thinning, which I consider the most important phase of orchard work." Many similar quotations from men of actual experience and from experiment-station workers could be offered in support of the value of this commonly neglected orchard operation.

A discussion of methods of thinning might prove of interest, but would have to be brief. Whether the hand or thinning shears is to be used depends on the variety and the preference of the workman. Thinning should begin at the top of the tree and be done in a systematic manner, one branch at a time. The distance between the apples which are allowed to remain will vary, depending on the size of fruit desired, the vigor of the tree, the strength of the tree, and individual varietal characteristics. All defective apples should be removed; all wormy ones brought in and destroyed. As a general rule, but one fruit should be left on the spur.

The advantages of this practice can only be listed here. Thinning is a definite aid to thorough spraying and of itself reduces the number of side worms. It enables the tree to produce apples of better quality, size and color. It prevents the breaking down of trees due to an overload of fruit and is much cheaper than propping. It conserves the vigor of the tree and the fertility of the soil by lessening the production of apple seeds—the most expensive portion of the fruit. If commenced early in the life of the orchard and followed up in a systematic manner it tends to promote an annual as opposed to a biennial habit of fruit bearing. All these are facts which have been proved by rigorously checked experiments.

The results, translated into dollars and cents, have in general been satisfactory. The Utah station experiments showed net profits of \$113.40 an acre without taking account of the saving in picking and grading at harvesting. The Michigan station found that about 1,500 apples could be thinned off in an hour, this being the number taken from a tree of medium size, and the whole expense of thinning was saved through decreased harvesting costs. And so experiments, practically all favorable, might be multiplied showing that it pays to thin. Why should Kansas growers not thin?

IMPROVED APPLE STORAGE.

No other element entering into the commercial side of fruit growing has made as rapid progress during the past ten years as storage. That and spraying are our really modern developments. Since storage methods have been perfected I know both growers and consumers who depend on one variety of apples for a twelve months' supply, and it is entirely possible to keep sound apples of any of the good late varieties for an entire year after they are taken off the trees. This, of course, would not be a good commercial practice.

Much of the valuable work looking toward better methods of fruit storage, including refrigeration during transit, has been done by the United States Department of Agriculture and may be found recorded in bulletins 579, 587, 601, 729, Farmers' Bulletins 879, 970, and others. This work shows that fruits can be safely and economically stored, and that storage should be provided in three places—the point of production, the point of consumption, and intermediate points favorable for railroad distribution. It shows that it is to the interests of the growers, either as individuals or through their associations, to control these storages at least in part. It has been the means of devising the best methods of constructing and managing such storages.

The construction of common and of cold-storage houses does not differ materially, except that the latter is seldom placed underground as is frequently the case with the former. The management of an apple storage house is comparatively simple, as a correct temperature of 32° F. and relative humidity of 80 to 85 per cent have been rather definitely determined and may be almost automatically provided for. Much experimental work still remains to be done with other fruits and vegetables.

Among the advantages of adequate fruit storage to the grower may be mentioned the following: They aid in avoiding market gluts, thus enabling the grower to place the fruit on the market as it is needed and to maintain a fair price. They enable him to avoid vast waste of fruit, for through their aid the alternation of periods of fruit feast and fruit famine have been eliminated and an even distribution assured. They enable the grower to retain control of his fruit for a much longer period, and thus to share in the profits due to a rising market, though this is not always an advantage, as the opening market price is sometimes the best one on which to sell. They enable the grower to expand the consumption of fruit by making it possible for him to maintain a supply of high quality throughout the season; and when applied in the form of refrigerated cars, vastly enlarge his profitable shipping area. The invention of pre-cooling refrigerator cars doubled the distance over which some of the soft fruits could be shipped.

It should be remembered, too, that there are certain things which storage cannot do. Since a fruit is a living, transpiring organism, its life cannot be indefinitely prolonged; low temperature merely slows up the life processes and delays the inevitable time of decay. Neither can the best of storage improve fruit. If it is bruised, infected with fungus, wormy or of poor quality when it goes into storage, it will come out the same kind of low-grade fruit, and will cause its owner a loss usually in excess of the cost of storage.

Proper storage of good fruit, the amount so handled being governed by the size of the country's crop and general business conditions, will pay fruit growers a good profit on the investment, especially during years of large yields. The safest course is not always the most profitable one to follow in disposing of a fruit crop.

SOME MARKETING SUGGESTIONS.

It does not require a very wise man to dispose of a fruit crop when the local demand for it is so great that a sign along the roadside will bring plenty of customers to his orchard with cash in their pockets. But in times like 1914 and 1915 the most difficult problem connected with apple culture is disposing of the crop at a profitable price.

In the past growers have given this matter attention only when threatened with disaster, which is too much like deathbed repentances to have really lasting beneficial results. Fruit is a product that must be disposed of in some way quickly after harvest. The market for it is one of the most treacherous and sensitive things in the whole business world. In years of abundant production, when the great bulk of the crop must go into the general market and stand on its own merits, a large coöperative organization of growers is frequently the only means of saving the producer's profits for that year.

Such an organization can do many things for a grower which he cannot do for himself. It can collect production and market statistics, and thus, as his representative, place the grower on an equality with the buyer when the crop is to be sold or contracted. It can create and maintain a demand for brands, grades and packs of fruit which but few individual growers can do. It can distribute fruit to much better advantage than can the grower. It can care for fruit while in transit and make sure that the grower receives justice in the large central markets. It can reduce the spread of price between the grower and the consumer, thus securing more for the one at less cost to the other, and at the same time increases the consumption of fruit. It can stimulate consumption of fruits by judicious advertising—something which but few individual growers are in position to do. It can secure just legislative enactments when an effort by unorganized growers would fail. It can demand that the railroads, the insurance companies and other large corporations give the member growers a square deal as well as obtaining better general service. Successful producers of commercial fruit for the general market are under present-day conditions practically compelled to organize in order to stabilize and expand the market for their product.

All of these seem to be a few among the many problems to which fruit growers should be giving their attention. The successful ones know that they can no longer give their whole attention to the producing side of the industry to the neglect of its marketing problem. Ours is a business which involves not only innumerable questions of the best and most economical

methods of production—questions relating to soils, plant physiology, disease of plants, entomology, and all the technical applications of these and other fundamental sciences—but also problems in economics and finance. Efficient preparation for such an occupation may well require intensive work throughout several semesters of a four-year college course, and such work the horticultural department in your Agricultural College offers to young Kansans.

May we not all be collaborators in this matter, as in all others relative to the upbuilding of the science and art of horticulture in this state? The men of this college department will always strive to keep their teaching and laboratory work abreast of the most advanced standards that the present state of knowledge permits. But they are dependent upon you for the application of horticultural science in such a way that young men and women will be led to see the joys and the profits of it and come to us for technical instruction; also, that when these students have completed the course and are ready to leave the college they will not be forced to go to other states to apply the knowledge they have gained.

Through the use of modern methods you have shown that good yields of high-grade fruit can be produced within the borders of Kansas and that the coöperative organizations of growers are strong enough to give stability to the selling end of the game, to the advantage of both grower and consumer.

WILL THE NEW ORCHARDS PAY?

D. E. LEWIS, President, D. E. Lewis Orchards Company, Kansas City, Mo.

It is a real pleasure to be here to-day to greet old friends and meet new members of this Horticultural Society. There is no doubt in my mind that I shall take away much more information than I can bring to you, and I have been much interested in the papers read and the discussions of the vital problems presented. Much good should result in this annual exchange of ideas on the problems of the fruit grower, and these meetings should be well attended, especially by the younger horticulturists of the state.

If I had known when your secretary asked me to discuss this subject of young orchards, that I would not have time to write a paper to read to you, I think I should have hesitated to accept his invitation, for it is hard to present a subject of this kind in an oral discussion from notes. Being enthusiastic about the subject and having been fortunate in securing valuable information from some of the best-posted men in the country, it is possible that I may be able to contribute something of interest to those who may be contemplating the planting of fruit trees and are wondering what they may expect in the way of returns from such a venture. Let me say in the start that my answer to the question of whether the young orchard will pay, is to be "yes," and I hope that I may be able to present the data collected on this subject in such a way that it may answer some of the questions which are in the minds of growers at the present time.

The fruit-growing industry is in line of the general reorganization which is taking place in every line of business. Part of this change has been brought about by the late war, and no doubt part of it has been made necessary in order to keep up with the changing demands of the trade and in

meeting competition. The methods of ten or more years ago are no longer adequate to meet the new problems of production and distribution, and the orchardist who would attempt to grow and market fruit in a manner which would have proven successful a few years ago is sure to meet with failure under the changed conditions. Even in the details of production such as pruning and spraying, the old methods are found to be antiquated, and this is even more true in the distribution and selling of the finished product.

In contemplating the planting of orchards good business demands that a general survey of the fruit industry be made to determine so far as possible the possibility of satisfactory profit to be derived from fruit growing. It is necessary to prove that the profits derived from the orchard will be greater over a given period of years than the same land might be expected to yield from the use of some other crop, such as corn, wheat or alfalfa. Let me say at the beginning that there is a great majority of land in this section that is not suitable for orchards, and we may eliminate such land at once in favor of some other crop. It is the land which is suitable for fruit trees that we will consider, for no greater mistake has ever been made than the planting of trees on unsuitable soil. The subject of orchard soils is entirely too extensive to be discussed in a brief talk of this kind, but in every case where tree planting is contemplated, soil and climatic conditions are absolutely the first factors to be considered and have been proven repeatedly to be the most important general factors governing success or failure. Each of the various important factors bearing on the success of individual orchards must of course be given intelligent study and be properly solved before any proposition can be made successful, but in this discussion we will presuppose that such solution has been made and that the orchard is properly situated on good soil, of trees well suited to the soil and locality, and that all of the work is done in a manner which will allow us to predict good crops. The question then becomes one of whether growing fruit under such conditions can be made profitable, and is of a general nature, dealing more with the future supply and demand than with any individual problem or single orchard.

SUPPLY AND DEMAND.

It is doubtful whether the law of supply and demand applies to any industry more directly than to the growing of apples. Wheat and other grains may be carried over from a year of heavy production to one of lighter yield, and even cattle may be held for months in anticipation of better markets, but the apple has a much more definite time in which it may be held. Cold storage has lengthened this time very materially, but even under the most favorable cold-storage conditions no method has been devised that will allow of carrying a crop from one year until the next. It is evident, then, that the amount of fruit of this kind grown any one year must find its way into consumption during that year, and that the demand must be sufficient to absorb any crop which the orchards of the United States can produce any one year. The history of the apple industry shows many years of overproduction and low prices, and this was notably common before cold-storage facilities and rapid refrigerator transportation were a part of our common facilities for handling the crop. During the past few years there has been less and less suffering by growers in any part of the country on account of an over-

supply in that part, and notwithstanding the fact that several of the largest crops on record have been grown during that time there has been enough demand to keep the price sufficiently high to allow a moderate profit. This condition is illustrated by the present year, when the United States has the largest crop on record, the United States Department of Agriculture estimate being 36,000,000 barrels produced during 1920. It is rather too early to obtain any statistics on the consumption of this crop, but I am going to predict that the crop will all be absorbed and that the records of the grower who produced good fruit will show a margin of profit. This prediction is made in view of the consumption of apples up to the present date and the amount of this fruit held in cold storage at this time. It indicates that the 105 million people in the United States are able to furnish consumption for practically a full crop from the present bearing orchards.

In determining the condition of orchards over the country a list of questions regarding the condition of the present bearing orchards, the probable length of life of these orchards, the extent of planting of apple trees, both of home orchards and on a commercial scale, during the past ten years, the ability of the orchards of any state to supply the demands of that state, together with a prediction of the probable planting in each apple-producing state, were prepared and submitted to the best authorities in each state of the apple-producing sections. Experiment-station men and the best growers were selected as being qualified to give the most reliable information, and in practically all cases the replies received showed careful thought and intimate acquaintance with existing conditions. It is doubtful whether a more comprehensive survey of orchard conditions over the entire United States could have been secured in any other way, as census figures are available only at long intervals and are open to considerable criticism by the time they are available. Comprehensive orchard surveys have not been made by most of the fruit-producing states, and it was impossible to find the information desired from any of the ordinary statistics. This fact makes the data of unusual interest, and derived from the best sources of such information it becomes of vital significance in answering the question of the future fruit supply.

On account of the similarity of climatic conditions and the varieties grown, the United States was divided into three sections. The first of these extends westward to the eastern line of Wisconsin, Illinois and Arkansas; the second or middle section westward from this line to the east line of Wyoming, Colorado and New Mexico; and the third or western section comprising the apple-producing states west of the middle section. Trees in the eastern section usually come into bearing more slowly than in the other sections, and soil and climatic conditions combine to make them larger and longer-lived. Varieties also are somewhat different from those grown in the barrel section of the Middle West, and both of these sections differ materially from the western or box section.

THE EASTERN SECTION.

The replies to questions from the eastern states indicate that the orchards in that section change more slowly than in either of the other sections. New York and the New England states have always been heavy apple producers, and there is nothing in the replies to indicate that any abrupt decrease in

fruit may be expected in these states. It is, however, important to note that while the population of these states has increased rapidly, the bearing acreage of apple trees has remained almost stationary, or shown a decrease over ten years ago. Only a few states in the northeastern part of the eastern section show any gain in bearing orchards, and such gain is more than offset by the increase in population. Approximately one-half of the eastern section reports a decrease in acreage, and only Virginia, West Virginia, Tennessee, New Jersey, Delaware and Vermont report a material increase in acreage. Of these states New Jersey, Delaware and Vermont are comparatively small in size and any increase in production will no doubt be absorbed by increased demand in near-by markets. West Virginia will almost double her acreage during the next five years, however, and Virginia and Tennessee will show an increase of from twenty-five to forty per cent in bearing trees. This increase in production will not be sufficient to supply the increase in consumption in the eastern states, however, if we assume that the increase in population will be followed by an increase in consumption in proportion to the past consumption per capita in that section. At the last census approximately two-thirds of the population of the United States were in the eastern section, and it is only occasionally that as much as two-thirds of the apples grown in the United States are produced in that section. The orchards of the east are comprised chiefly of comparatively old trees, and it is an assured fact that, with the exception of the few states noted above as showing increased production, less apples will be produced five years from now, and a larger decrease may be expected during the five years following. These facts are based on the known facts that ten or more years are required to bring a new plantation into profitable bearing and that the present bearing orchards are of such age that a decrease in production will naturally take place. These facts are borne out in the replies received from the East; and while nothing bordering on an apple famine is predicted in that territory, we can safely assume that the eastern section cannot entirely supply the home demand during the next generation of orchards, and each year will draw heavily from the other two producing sections.

THE WESTERN SECTION.

The western section is second in volume of apples produced, and an examination of the replies from that section is of vital interest in connection with the prediction of the future supply, chiefly on account of the fact that the orchards of the West are comparatively young and may be expected to show an increase rather than a decrease for some time. Fruit growing has been made a business in the West, rather than a side line, and the highest degree of intelligence has been brought to bear upon the growers' problems. Profiting by the mistakes made in the orchards of the East and Middle West the growers have used better selection of varieties and generally have given the trees and fruit better care than were given the orchards in either of the other sections, especially during the formative period. As the western orchards began bearing the grower was confronted with numerous handicaps, including production costs, transportation and distribution, and it was necessary to give the orchards the care required to produce high-grade fruit and to organize for successful distribution. The result has been the elimination

of the growers who were content to grow moderate-grade apples and to establish standard grades and methodical distribution. Even under this careful supervision it has been impossible for the grower to eliminate his natural handicap, and as a result planting has almost entirely stopped during the past five years, with the result that the peak of production in the western section may be expected to be reached within about the next five years. This being the case, we may estimate fairly closely the extent to which the western section can be expected to supply the demands of the other sections during the next generation of orchards, and from the data available covering production and consumption, it would be impossible for the orchards of the West to supply enough fruit to meet the demands of the Middle West as well as supply the local demand even if the export is ignored. There will always be a demand for boxed apples in the East as well as a demand for this kind of fruit abroad, and it is entirely possible that the demand may increase fast enough to keep pace with whatever increase there may be in production in the West. The high cost of production and transportation of western apples is also an important factor in favor of the other two sections, and will naturally prevent the West from supplying the markets of either of the other sections to the exclusion of home-grown apples. Should such a condition be reached the West would be selling apples at a loss and would not long be an important factor in the industry.

THE CENTRAL SECTION.

A careful examination of the orchard conditions of the Middle West reveals a rather startling condition. From the time when the orchards of this section were producing several times the amount of fruit consumed in this section, orchards and production have deteriorated until at present but one state in this middle section produces enough apples for its own use. Arkansas has the distinction of growing enough fruit for home demand, but every other state in the Middle West is dependent on some other section for a part of the apples consumed within the state. Iowa, Illinois, Missouri, Kansas and Nebraska are reported as losing from twenty-five to as much as fifty per cent of the bearing apple orchards during the past decade or a little more. Michigan and Wisconsin show a little smaller per cent of loss, but even these states are producing less fruit than formerly. This fact is important from the standpoint of the future orchardist, but even more important is the fact that little effort has been made to replace these orchards. No doubt the rather unfavorable experiences of the first orchardist in these states has had a bearing on planting, but it should be remembered that the demand as well as the possibility of distribution should be taken into consideration when such a comparison is made. The first orchards set in the Middle West were not profitable, largely because of the limited market that could be reached at that time, as well as the fact that unsuitable varieties and soils were used and that practically all such orchards were grown without care and the attention necessary for successful production. It is rather a wonder that the trees have lived and borne as long as they have, considering the care they received.

It would probably be less profitable to grow orchards of this kind in the future than it has been in the past, as no doubt neglected trees would never reach profitable production with all of the handicaps of insects and diseases

which we now have to contend with; but this very handicap insures a demand in the future for well-grown fruit, and everything indicates that local or state demand will improve steadily during the next generation of orchards. It is a fact that only about one-half of the area of the Central West is situated within the apple-producing territory, and it is a more important fact that only a comparatively small per cent of such territory is suitable for the commercial production of apples. There seems to be little doubt, therefore, that a comparatively small area in this central section will be called upon to supply the entire section, or at least that part which is not easily available to the West. Just at the present time these fortunate apple-producing sections are little more than supplying the territory immediately adjacent to them, and each orchardist is finding an increase in local demand each year. Such demand should increase as the present orchards decline, and it is doubtful whether the central section will be shipping to any distant markets in a few years, conditions indicating better prices in local and near-by markets.

The Central West is fortunate in having certain sections peculiarly adapted in soil and climatic conditions for the production of apples. The Missouri and Mississippi valley sections probably lead in this respect, but other sections such as the Arkansas Valley and portions of the Ozarks are well adapted to this fruit. Selection of soil in any given locality, as was stated at the beginning of this discussion, together with the selection of varieties adapted to the soil and climate, will be two of the most important factors for consideration in future plantings. The care of the trees from the time of planting, as well as the maintenance of soil fertility, cannot be neglected and good yields result. All of the details of production and distribution must be given the same care and thought that would be required to assure success of a banking or other mercantile venture, and when given such attention the young orchard of the Middle West will prove profitable. The future outlook from the standpoint of demand was never better than at present, and the combined demand from distant and near markets assures profitable prices for the apples produced during the next generation of orchards in the Middle West.

DISCUSSION.

A. L. BROOKE: I would like to ask Mr. Lewis if his firm has kept any statistics on the increase in the use of the apple? Has there been any perceptible increase?

D. E. LEWIS: So far as demand is concerned, the demand is generally increasing faster than population. Of course there are various uses for the apple, increasing demand for it. No; I have no data on that point.

J. B. WHEELER: It might be a good place right here for me to relate a little experience I have had. You must grow big fruit. I have seen gooseberries as big as goose eggs. How did they get that way? I picked all the sprouts from that bush except two. That is the way to get nice fruit—take good care of it. Give an apple tree as much care as you give a hill of corn or a hill of potatoes and it will grow hearty fruit; but we do not do it. The idea is not to grow so much fruit, but to grow better fruit and get good quality and put it up honestly and attractively—just as good in the bottom and in the middle as on top—and you will have everybody calling you blessed. They will say, "Give me that brand if you have it."

J. G. MAXWELL: I would like to ask Mr. Lewis what other varieties besides Winesap and Jonathan he considers adapted to the Arkansas valley?

D. E. LEWIS: I would make it probably around seventy per cent Winesap. That valley is perhaps as well or better adapted to the Winesap than any of the soils we have in this territory. We have in the Winesap a variety that colors well. I should make it at least that per cent of Winesap. Then it would depend somewhat on where I was shipping. The Missouri Pippin is a variety that does well in that valley, while there are points against it. It is a first-class apple, grows to a good size, and comes into bearing young; and while it has to be cut heavily, yet I believe it is worth it. These two varieties, especially, I would grow there.

MISS NILES: When I heard that we had the biggest crop of fruit this year that had ever been raised, I thought, oh, how delightful! and then when I thought about going downtown and paying \$5 a box or ten cents apiece for apples, I thought there must be an awful spread between the grower and the ultimate consumer. I remember one time I bought a box of apples and paid \$5 for it, and in the bottom of the box was a note from a lady. That box was packed near Grand Junction, Colo., and the note said that the orchardist who packed it had received the magnificent sum of \$1 for the box, and there I had paid \$5 for it. How can we be consumers and purchasers when we have to pay such a price as this? How are we to make orcharding attractive, that people will be anxious to plant orchards and anxious to work for them, that people will be well supplied with good fruit?

W. L. LUX: We all like good fruit, like to grow it, but anyone that has lived in this section of Kansas knows that we have about five dry years to one wet one. When we have a wet one like last year we certainly grow fine fruit. If we could get together and find out how to make use of low-grade apples and use more of them in cooking and in other ways we would have apples and at a much lower price. Sometimes the smaller fruit, while it is undersize, is of good quality, and if we can devise some means to use this lower grade of fruit there will be more demand for it, but as long as we discourage the use of anything except the very best we are encouraging high prices for the best. All of the people cannot pay \$5 a box for apples, but they could pay \$2 and get very good apples.

PRESIDENT HOLSINGER: One difficulty is that a lot of us buy apples for looks as much as for use. For a great many years I sold fruit on the Kansas City market, and I know how that is. The laboring people would buy the best or not any. You cannot get them to take second grades, and while they have the money they are going to pay it. Mostly people of the laboring class—and they are the most of us—want good fruit, and while they have the money they will get it.

A. L. BROOKE: Something occurred to me when Mr. Anderson was speaking this forenoon, and I want to say this: We generally have a good market here in Topeka. I wish we could issue some propaganda that would teach people that there is a certain season of the year for certain varieties of apples. I get discouraged in going to the telephone late in December, after Jonathan apples have been off the place for six weeks, and have them say, "Have you any Jonathan apples?" Now, there are other apples better than the Jonathan, better in every way than the Jonathan, better for the table—

even the much-despised Ben Davis is a better cooker—and still, “Do you have Jonathan apples?” Any intelligent grower gets discouraged with the little lack of knowledge that the consumer has when they are inquiring always for the Jonathan apple when its season is passed.

APPLE PRODUCTION.

W. G. FARNSWORTH, Waterville, Ohio.

There are so many phases to this subject that I do not know just which one to emphasize here. The question differs in different parts of the country. I am interested in the entire field of apple production and have studied it. I have sometimes heard it said that we are growing too many apples. It was President Harding, I think, who said 700,000 bushels of wheat were worth more than 1,000,000 bushels of apples in dollars and cents, and that 9,000,000 bushels of corn than 13,000,000 barrels of apples.

As some one said this morning, apples so far have been considered as in a class of luxuries. Now, so long as they remain in that class they have not gained the point that the wheat, corn and cotton have reached. I ask the question, Are we growing too many apples? Or shall we increase the production? I want to bring some facts to your attention. I think we can produce better apples than we have been; that we are not producing as many apples as we ought to produce and as we can produce profitably. When we get to the point where the price is so low that we cannot get a reasonable compensation for our efforts, then I say we are overplanting. Friends, we are not at that stage yet; in fact, we are going in the opposite direction.

There are many ways in which we can increase apple production. One is by increasing the production from the apple orchards already planted. I am speaking from the standpoint of apple orchards in Ohio; also for practical orchardists. Many of our old orchards are dying out. I have had experience in reclaiming these old orchards and building them up. It is wonderful how they will respond to proper fertilization, spraying and pruning. I remember taking one old orchard of about six acres, nearly twenty years ago, that had been neglected and was in a terrible condition, and cleaning it up, cutting off the lower branches and giving it general good care and having it come back. It was a difficult task to bring that orchard back into successful fruitage; it was a hard fight for several years, but now for the last ten years it has produced a good revenue on the capital invested.

The general interest in apples is perhaps in the Northwest, but there are other places just as good for apple production. I am thinking of one man who had taken an option on an old orchard at \$600 or \$700 per acre in the suburbs of Valeria. He talked with me and wanted to know whether I thought he could afford to take it. I said it depended largely upon him as well as on the orchard. He wanted me to look it over, so later we did go and look the entire situation over. It was a desolate-looking place; trees probably thirty years of age; a great many were Baldwins and Ben Davis. It was a doubtful question as to what to advise him. He was paying a long price and the trees were in very bad condition. A bird could hardly fly through the orchard, the brush was so thick. It was infested with San José

scale and diseases of all kinds. The orchard was a breeder of disease for all other orchards in that entire country. I studied the situation and said, "Are you willing to expend considerable money and take the chance? It will take work." He said, "Yes, if I can win out." There was a man with the right idea, who could look ahead for his returns. I said, provided it was properly handled, I thought he would be successful. That very spring he started activities. He cut out old branches, opened it up, cleaned it up, sprayed again and again; if anything I thought he overdid it. But let me tell you the result. The next season I dare not say how many barrels of apples he harvested, but it was a good crop, and the following year paid for the entire orchard out of that crop, and has had a crop every year since. It in no way resembles that which he bought for an orchard. He believed in proper spraying and he consistently practiced it. He soon had paid for the orchard four times over, and was much elated and did not complain in the least. What that man did we can do with many of our old orchards that look neglected and are neglected. They can be brought back to production.

This year you know that fruit prices were rather in the extreme. I cannot say just what the prices were in this part of the country, but in our own section apples were selling from \$2.50 to \$3.50 per bushel, depending on the pack and grade. That, friends, is one of our greatest burdens—proper packing and grading. That has very much to do with successful orchards and orcharding.

For a few minutes I want to give you some statistics. I want to bring a few facts from the department at Washington that will bear out the statement that we not only want to increase the productivity of our old orchards, but we must continue to replant and to plan new orchards. I would like to emphasize that fact here in Kansas, for I firmly believe that you have the soil, and I know you have the men who can make a success of apple growing. You can make it an absolutely successful enterprise. You can get from \$500 to \$1,000 per acre. I know that to be a fact in Kansas. Supply your own localities and stop bringing in apples from the Northwest.

In 1910 there were 151,322,000 bearing trees in the United States and in 1920 only 115,265,029, or quite a per cent less than there were ten years before. On the other hand, what about our population? That is increasing, while our bearing trees are decreasing in number. Let us go further. In 1910 the nonbearing trees or young trees in the United States numbered 65,791,848 and in 1920 36,000,000—about one-half as many as ten years before. Summarizing, we find the total bearing and nonbearing trees combined in the United States in 1910 numbered 217,000,000, while in 1920 there were only 171,000,000, or about 57 per cent bearing and nonbearing trees in 1920 as compared with 1910.

Let me give you some Kansas figures. In 1910 Kansas had 5,633,986 bearing trees and in 1920 she had 1,230,952. In other words, in ten years Kansas has dropped off from nearly six million bearing trees to one and a quarter million. Yet you hesitate to plant orchards and you are importing the apples that you consume.

How many persons here have had all the apples they wanted to eat at all times this year? I would like to ask for a showing of hands on that, but I will not just now. There are thousands and thousands of farmers as well

as city people who do not have apples enough to eat. Apples are not a luxury, but a necessity—a necessity in the diet, and not a luxury to be indulged in by only a few. Still we find that Kansas, instead of having nearly six millions of bearing trees, as in 1910, has only one and a quarter million in 1920, or, in other words, not 25 per cent of the trees she formerly had. Kansas in 1910, including nonbearing with the bearing trees, had 6,545,376, and in 1920, including the nonbearing and the bearing trees, had only 1,688,522, or about 25 per cent of the number she had ten years before.

I believe with proper advertising and education of the public in general the value of fruit as food could be shown and we could have a larger apple-eating population.

Our total crop in 1920 was 99,000 cars. Allowing 250 barrels to a car and three bushels to a barrel, the total amount was 75,000,000 bushels. This would be about two-fifths of a bushel for each man, woman and child in the United States. Seeing an opportunity, no less than action, makes the difference between success and failure. The successful man sees the opportunity, seizes upon it, and improves it. The unsuccessful man is one who fails to see the opportunity, and it passes by him. I think the farmers and fruit growers of Kansas have an opportunity right at hand, and I further believe that they will accept the challenge and will grow just as good fruit as an adjoining state or any state farther away. I hope so at least.

A talk I had along the line of advertising with Doctor Baxter, of the fruit commission of Canada, brought out an interesting fact. He said the British government tried out the plan of advertising through the provinces of Canada, with the result that after careful tabulation it was found that the consumption increased about two and a half to three times what it was prior to the time of the advertising campaign, which was inaugurated to show the people the value of fruit as an article of diet. Clark Ellis, of New York state, gave a paper on fruit production at a certain meeting. Of course he talked about cider; I do not know whether it would be safe at this time. He spoke of the very fine value of apples as food and said we should advocate education along that line, so that all would know the value of fruit as a food and use more apples. As a result, using apples would not be an event to a man's family, but a common, everyday occurrence. Many of the so-called fruit-juice preparations contain no fruit juice at all. We should as producers of fruit demand our rights on that point. It is reported of Queen Victoria that she fully realized the value of cider, and that she took all her pills in cider.

The statement has been made to the effect that the population is about twenty-five per cent greater than it was ten years ago. Twenty years ago there were, considering the population, twenty bearing apple trees per person in the United States, including man, woman and child. Ten years ago there were one-and-a-half trees per person, including everything—all tree and small fruit. To-day there is only one bearing tree, on an average, to a person. I think you will see without any further comment along this line that we must continue to plant apple orchards. If not, what will coming generations do? If we go on ten more years, until 1930, at the same rate of decrease we will have only 83 million instead of 115 million bearing trees in

the United States. That is driving the apple further and further into the class of luxuries and further and further away from the common people.

The old saying, "An apple a day will keep the doctor away," is not so very far wrong. An old Jew's wife had been sick, and although they had the doctor she did not seem to get well, and the doctor's bill grew. So one day Moses went downtown and stopped at a fruit store. "Jacob, send a barrel of apples up to my house." That night on arriving home Moses was met by his wife, who said, "Somebody sent me a barrel of apples to-day." All he replied was, "They tell me an apple a day will keep the doctor away." He realized the value of apples.

If we can furnish the people of the United States with an apple a day we have to get busy and plant more apple trees. We will then have better health and a greater prosperity and the producers of fruit will be considered a blessing to the public in general.

There is another factor to be considered. We can plant as many trees as we have a mind to, if we stop at planting, production will not increase. Many have already done that, they planted the trees and thought they would take care of themselves. If we continue that our production will fall to a lower per cent than in the past ten years. If we decide we must not only take better care of our old orchards, but must continue to plant new orchards, we have a few questions confronting us. What must we plant?

In looking over the reports of the exports to foreign countries, I find this sad fact, that Canadian fruit is selling at a margin above that of the United States fruit on foreign markets, often as much as one and a half to two cents per pound. Why? Variety. Canada and the British provinces are raising and selling the Jonathan, Missouri Pippin, McIntosh, and varieties of that type. They have quality, and call the consumer back, wanting more. A large per cent of the United States exports are of the varieties that keep well, as the Ben Davis, but lack the quality that draws the consumer back. Friends, in planting let us remember that these inferior grades may for the time being bring us many dollars and cents; but if we want quality that will induce greater use of the apple as food, let us furnish something that will satisfy the consumers—a fruit of quality that will please the public, increase the demand and cause the consumer to repeat his orders. We must grow apples of high quality. You can do that in Kansas as well as in any part of the United States; I think better than some places.

We must have faith and confidence in our business; we must have a vision of the future. That is what I am trying to impress upon you this afternoon. We must be initiative. Men with a vision will win out; they must have faith in their business and confidence in themselves. Apple growers with this vision can see light where there is none and grow apples where none grew before. We need not be extremists in either direction; but we must have faith in our business that offers success, whether in growing fruit or in some other line of business. We must have men in the apple business with business capabilities who are putting their faith and business ability into the apple industry. We must study it and make a business of it; then only will we succeed.

This question comes to us: What about conditions? Your conditions are

different from mine. I am not a man who likes to come out here to new territory and advise you just what to do. I will only offer some suggestions. Take them with a grain of salt. If you can adapt them to your conditions, do so; if not, try them out on a small scale. Study your problems and you will win out.

Where will we plant our orchards? Shall we look at the high-priced land? That depends entirely upon the location. If the high-priced land is especially fertile and adapted to apple growing and located close to a good market the consumer will come to your orchard and you can get retail prices, delivered direct to the consumer. I believe and know there is profit in land at \$500 to \$1,000 per acre for orchards in the proper location. There are other lands that are located just as efficiently, but not the right kind of land. That would be a waste of time and talent. Go back farther, although the land is not located so favorably, but is suitable for apple culture; it will be the best land to buy. Where you grow your orchards depends upon your conditions and environments. Grow them right in your own state, your own state of Kansas. I know you can make a profit of 50 to 100 per cent on the investment. Kansas orchardists are doing it.

I regret that the farmers do not grow more of their own fruit; but, gentlemen, I believe the time has come when most of the farmers have decided to buy their apples rather than grow them. With insects and disease of all kinds to contend with, they believe it is better to specialize on their own branch of agriculture and buy the fruit. We are coming more and more in this old world of ours to specialize. The general farmer and grower have enough to do and enough branches to study if they make a thorough success of their own line of work. It is the same way with the horticulturist. The farmer has acquired the habit of buying his fruit, and it is often a little more trouble to raise his own than to buy from the experienced grower.

I am sorry it has come to this point, but, as has been said, many of our home orchards are a menace to the commercial grower as a breeding place for diseases of all kinds. As long as that is true we will expect the farmer to buy his fruit.

After we have selected the site and planted our orchard it is all wasted time and expense unless we follow with something more; that is, pruning, spraying, feeding, and activities like that. I think we have been misled on the pruning question. Years ago we practiced rather severe pruning. When we set out our apple cuttings we pruned to three branches, then pruned each year thereafter. Next to the last orchard we set out we changed our tactics. We pruned it when we set it out, but have pruned very little since. Now it is about six years old, and last year we had from one to six bushels to a tree. Jonathans had from one to six bushels per tree. We did cut out some cross branches to allow free circulation of air. As the trees come to bearing we will cut out more and more. As we cut more of the cross branches out air can circulate better. In New York state at one experiment station they experimented with a large number of apple trees—one row of each kind and four in a row. They used similar soil, exactly the same conditions, same age and cultivation, except pruning. They went to the extreme in the experiment, but that is their work. I was pleased to know the results, as they were more than I expected. The blocks of unpruned trees were the best in nearly all

cases; the trees were rank and straight. They are, I should judge, about eight years old. There is not much difference in the fruitage as to amount, but the unpruned trees had larger and firmer fruit. That took the idea of severe pruning out of me. But I like to keep the middle of the road; there is danger of us swinging too far to either side. We are not intending to do much pruning until the trees are eight or ten years of age, except enough to allow free circulation of air.

Then as to spraying. You know what that means—success in the highest sense of the word or absolute failure. If I could not spray my trees and had to let the fungous diseases grow on them I would destroy them. I mean by spraying, real spraying; not sprinkling. I mean to equip yourselves with the machinery and do the work efficiently. I mean using the machinery and material of a quality that will put the material on the leaves and cover them; that when we put on the spray we cover the fungus and prevent apple scab and apple diseases. By doing that and completely covering all fungus, etc., we are putting dollars into our pockets' later. If we can have only one pump, and if it costs twice as much as another to get a good one, let us get it. Get the brand of spray that will cover well. Some other kind may be worth more in dollars and cents, but not be as valuable as a covering, because it will not cover and stay on. Get the best; that means efficiency. I want to encourage the buying of good equipment for spraying and for all kinds of work upon the fruit orchard. Now I want to say just a few words on fertilizing. I was highly pleased with the remarks this morning on fertilization. The question was raised as to whether or not the use of stable manure would not cause the roots to grow too near the surface of the ground instead of going downward. Mr. Ballou of our experiment station made some experiments along that line by mulching, in Ohio. He mulched early and kept on mulching. Later Mr. Ballou dug down two feet and found the mulch had some of the feed roots in it; next foot had some larger roots and branch roots, etc. So he made a comparative test and found that the first foot of ground grows the larger per cent of roots on mulched ground than on that not mulched; the same held true in the second foot of ground. But from there on down the best root system was found in the mulched ground. This shows the fact that while the mulching had enlarged the root system at the top it had strengthened the entire system. The root system—that is, the entire root system—was enlarged, and the fact that a few more of the feed roots did not grow near the top of the surface instead of going down had no serious effect on the entire system. We mulch in our own orchards.

This morning the use of nitrogen was spoken of. We do not get good results from the use of potash. Our soil is rather rich in humus. We believe in the use of nitrogen. We have been feeding our trees from the time they were planted. The facts are that in feeding we develop the root system thoroughly. We use nitrogen in several ways. We use it early in the season before the blossoms open; this helps to set the fruit as it blossoms. We use it occasionally later on if we discover it is needed. There is this danger in land that is comparatively rich, and especially if it has a high per cent of nitrogen—the danger is of getting an excessive wood growth instead of fruit buds; that is, the tree develops wood but not fruit. We have had trouble along that line. We expect to quit using nitrogen. We will use phosphorus instead. We will

have balanced food rations. If we use too much nitrogen we will get too much wood. If we can get the right proportion of nitrogen and phosphorus we will get a strong development of fruit buds.

Summing up, I hope I have made plain to you that I believe we ought to produce more apples, as many more as we are already producing. Sometimes we think we get better and cheaper ones from the Northwest than we do from Kansas. Let us get that out of our minds. They have poor apples, but they leave the poor ones at home. I think we should do the same and use them in some other way. I believe we can grow more apples and at a profit if we will put the proper amount of thought and study into it and go about it in a businesslike way, and when we do that in Kansas I believe the time is coming when you will say amen to some things I have said this afternoon and you will grow as many apples as the Northwest, even on \$500 to \$1,000 an acre land.

DISCUSSION.

SECRETARY WHITNEY: Here are some pecan nuts from near the north line of Nemaha county.

C. S. RITTER: I have some pecan trees, but they are not very successful down our way.

PROF. ALBERT DICKENS: This is the first report I have had of pecans producing fruit that far north. The study of the pecan is interesting, and we have made many observations on the distribution and improvement of the pecan. We have set out some seedlings and we are hoping to have some results to study them from. The Arkansas valley is interested in pecans. Several miles south of Arkansas City there is a pecan orchard. That part of the farm that has the pecan orchard is the best investment on the farm. Last year they gathered 1,000 pounds to the acre from the ten acres, and sold the 10,000 pounds for 10 cents a pound. The pecan is possibly a little harder than the peach. We may have a pecan crop when the peach is injured. I think one cause is found in the catkins. The staminate flower is considerably harder than the pistillate blossom. The pistillate is very inconspicuous; it is less conspicuous and showy than the staminate flower. The freeze last Easter put the black walnut out of business for this year. We are trying some experiments with walnuts now. The other day there was brought into the office a soft-shelled walnut. Whether or not they are always like the ones that were brought I do not know. They are young trees. The nut had a small husk, and it was full of meat, soft of shell and cracked readily with a nut-cracker. We will graft that to the common walnut next spring. It is the first soft-shelled one we have had. Whether or not it will retain that soft shell we do not know.

RALPH SNYDER: I do not think the pecan of much value in this state. We planted trees twenty or twenty-five years ago, and we have good trees but no crops. Two years ago we had more nuts than we ever had before. I have not heard this year, but suppose we did not get many on account of the freeze. There was none last year or the year before. The trees are large enough and old enough to bear, but they have not been a success. I think father came to the conclusion that it was too far north to successfully grow pecans. The nuts that were gathered were not particularly good.

POTATO DISEASES PREVALENT IN KANSAS, AND THEIR CONTROL.

PROF. L. E. MELCHERS, Plant Pathologist, State Agricultural College, Manhattan, Kan.

POTATO SCAB.

The most common treatment in the early days was a so-called dipping treatment in which the uncut seed was dipped into barrels, using about one pint of formaldehyde to thirty gallons of water, and left there for a couple of hours and then cut and planted. Potato growers called that the treatment for potato scab, and such it was. In fact, in those days the potato scab was practically the only disease that the potato grower knew very much about. Everything was potato scab, and when the crop didn't grow just right it must have been the scab. In some years they noticed fairly good results with this treatment and some years they didn't, and for a while there was a lull in the treatment. The potato scab is perhaps the least important potato disease of this state; it does the least amount of actual damage. The trouble with the formaldehyde treatment was that it didn't seem to control other things; didn't get to them. That treatment will control scab, but will not control other new diseases and the ones that are actually causing damage.

About three years ago we tried to demonstrate—it had been more or less a war measure—that potato seed in this state could be treated with a treatment that would reduce some of these diseases and give a better stand, and therefore a better yield. Experiments were made on the farms of a few of the better potato growers here in your county and in other counties in which they were interested enough to coöperate with us and allow us to treat their potato seed with a new solution—a different solution than they had ordinarily been accustomed to using—and this was the so-called corrosive-sublimate treatment. Corrosive sublimate, as most of you probably know, is a rank poison if taken internally. However, we treated a rather large acreage of seed with this solution and found that the stands were very much better. Since these first demonstrations have been carried out I think most of the potato growers who are treating seed at all are using this corrosive-sublimate solution and will say that it is beneficial. Without a doubt it prevents blackleg and black scurf from causing a poor stand. In our work last year on the farms of Kelsey Bros., of this city, both of them used corrosive-sublimate treatment, and they believe, and I think they were convinced, that their stand was very much better, and as a result they had better yields. We are convinced that this is the treatment to give potato seed for this state, not only because it will control these two diseases, blackleg and black scurf, but also will control scab as well as the old formaldehyde treatment. That, perhaps, is the first step that we have taken in trying to get a greater potato crop.

TIPBURN.

Our second attempt is yet in the experimental stage, and we do not know how it is going to succeed. We started spraying last year to see whether we can in any way reduce this tipburn which I spoke about. This is in the potato crop nearly every year more or less. Last year it was here less, perhaps, than any season since I have been connected with the Agricultural Col-

lege. We are endeavoring to ascertain if spraying with Bordeaux mixture is of value for reducing this tipburn. There is no question that it will reduce or practically eliminate the early blight. It happens that early blight is not here every year. It may not come oftener than once in every three or four years, and growers will then tell you, "I wish I had been spraying for the last five years." We have not felt that we can consistently recommend spraying with Bordeaux on the potato crop every year, for the reason that we are not sure enough yet what the results are going to be in connection with tipburn. It is quite an investment and it takes money to spray a whole potato crop three or four times, and then if you do not have the blight for four or five years you will say, "Look at the money we have spent."

DISCUSSION.

A MEMBER: How about black leaf 40?

PROF. MELCHERS: We are trying to find out whether our conditions here in Kansas are exactly the same as they are in some of the other states where they have been controlling tipburn. If the conditions are the same, then sprays which are being tried out should bring some results. Iowa and New York and one or two other states have controlled tipburn with Bordeaux mixture. If that will hold for this state, then there is no doubt that it will be recommended, because we will have insurance against the blight, and if it will control that we know it will control burn, and in that case we can control both of these troubles. This is still in the experimental stage, however, and besides the use of Bordeaux for tipburn we will try out various combinations this year in which black leaf 40 will be used. On the other hand, there are a number of factors that are probably entering into the tipburn problem, and whether they are the same all over the country will be found out by our experiments and trials.

I should say in conclusion that the Shawnee county potato growers for the past year have been saved about \$78,000 by having treated their seed and getting a better stand. One party at Lawrence, or in the vicinity of Lawrence, Kan., I was told recently, claimed that he had saved \$3,000 by getting a better stand.

I am not an entomologist, and the entomologists now are beginning to claim that they know a little bit about what causes tipburn. I was called to Olathe on an emergency case of tipburn. We arrived Sunday morning, and walking around there, it looked as if there were a million little nits flying in front of us all the time. If you would examine one of those leaves you would find where it seemed to be burned around the edge. In other words, it was forming the tipburn. We began spraying there about nine o'clock, and reports from about twelve farmers indicate that they saved their crops, and some of their neighbors across the fence who didn't spray their potatoes that Sunday and Monday following lost their entire crop.

THE PRESENT STATUS OF ORCHARD FERTILIZATION.

F. C. BRADFORD, University of Missouri, Columbia, Mo.

Investigation has shown that practically all agricultural soils are abundantly supplied with most of the seven mineral elements necessary to plant life. Experiment and practice have shown that deficiencies are likely to occur in only three—nitrogen, phosphorus and potassium. Lime is frequently applied to correct acidity, but not because it is actually required as a plant nutrient. The so-called "complete" chemical fertilizers contain nitrogen, phosphorus and potassium in combinations varying with the locality in which they are sold and with the crop for which they are designed. Potatoes, for example, in many places respond markedly to potassium applications; tomatoes in some places are greatly benefited by phosphorus.

For some time it was thought that fertilizer requirements could be determined from an analysis of the plant, showing the amount of each ingredient removed from an acre of ground and consequently the amount which should be returned in fertilizer. On this basis it was figured that apple trees, for example, would require so much nitrogen, so much phosphorus and so much potash, and complete fertilizers were much in vogue for the orchard, many fertilizer companies selling an "orchard brand" or "fruit fertilizer" containing these ingredients in combinations considered best suited to the requirements of the trees.

Recently, however, reports from careful experiments in various parts of the country have upset these earlier views. These reports cover results over varying periods of twenty years or less, and in different soils in various sections from New Hampshire to Oregon, from New York to West Virginia. Comparison of these experiments reveals striking differences, ranging from no increase in the crop to a sevenfold increase, and from an actual loss in money to abundant returns. There is, however, a general agreement in some respects: potash applications have almost without exception resulted in no increase, wherever tried; phosphorus applications have been almost as uniformly unproductive. The one element that has stood out conspicuously, where fertilization has proved profitable, is nitrogen.

Nitrogen is the most variable, transitory and elusive element with which the farmer has to deal. Vast quantities of it occur in the air, but most plants can make no use of this supply. The soil may have an abundance this week and very little the next after a hard rain which leaches it out. One of the chief reasons for the beneficial effects of stirring the soil lies in the stimulation of the processes by which nitrogen is made available to the plant. Herein lies one of the chief benefits from green manuring; and to their peculiar power of appropriating nitrogen from the air is due the especial value of clovers, beans and peas as soil improvers.

There are several distinct ways in which yields of apple trees may conceivably be increased: (1) Obviously, the larger the tree the more opportunity it has of bearing large crops; consequently, a fertilizer that makes a larger tree favors an ultimate increase in yield. (2) An increase in the number of apples "set" from a given number of blossoms will have the same effect, though the size of the tree is the same and the number of buds unchanged. (3) An increase in the size of the apples, though there are no more of them,

increases the yield in bushels. (4) If an increase in the percentage of fruit buds formed can be secured, particularly for the off year, an increase in the crop should result. Conceivably, a weakness in any of these respects may limit the yield of fruit, and if this condition obtains a fertilizer may increase the yield by removing this particular limitation. It is important, then, to know exactly what is limiting the yield and to know whether fertilizer will have any effect on this particular limiting factor.

There is abundant evidence that nitrogen promotes vigorous growth and large size. It is frequently thought to do this at the expense of productivity—temporarily at least. This inducing of vigorous growth is the best-recognized function of nitrogen, and can be counted on more frequently than any other effect. On rather light soils, where tree growth tends to be small, the crops may be increased by this effect of nitrogenous fertilizers. It should be realized, however, that when trees are forced in this way to a growth greater than normal for the soil their requirements are greater, and such treatments must be continued else these large trees may starve while smaller trees in the same soil retain a fair measure of thrifty condition. Furthermore, in regions or sites subject to drought a wet year in combination with nitrogenous fertilization may induce a vigorous growth that will require and consequently make the trees subject to drought injury. Finally, in the majority of mature orchards the size of the tree is not the limiting factor, since the trees are large enough and increased yields must be sought in some other way.

The second possible benefit from fertilization lies in the increase of the percentage of set; in other words, in the development of a greater number of apples from a given number of blossoms. Weak trees often blossom very profusely but set very few fruits, even though there is every opportunity for cross-pollination. It is in correcting this condition that some of the most spectacular gains from fertilization have been secured. Applications of quickly available nitrogenous fertilizers such as nitrate of soda or sulphate of ammonia about two weeks before blossoming have increased the yields threefold, fourfold, or even sevenfold, simply by increasing the set of fruit. Obviously, since the fruit buds had been formed in the previous season, no increase in fruit-bud formation could have been secured.

Sometimes this effect becomes evident on trees that cannot be considered weak. In the spring of 1920 the Missouri agricultural experiment station made some early spring applications of nitrogen to some York trees in an orchard in the loess soils along the Missouri river. Since the unfertilized trees in this orchard averaged twenty bushels each that year, it is evident that these trees were not weak; nevertheless the fertilized trees averaged something over twenty-five bushels each. There was an increase per tree of five bushels at a cost of about twenty cents in fertilizer.

Here, then, is a method of fertilization that will bring quick returns. It should be noted, however, that this type of fertilization carries no guarantee of an increased crop in the following year. In fact, so far as it increases the crop this year it is likely to militate against the formation of fruit buds for the following year's crop. It should be noted also that so far there is no evidence that fertilizer application to a tree that is not bearing will help it to form fruit buds. If a tree is in its off year, but still blossoming somewhat, fertilizer application may, by increasing the set and the off-year crop, tend

somewhat toward reducing the crop of the "on" year, and so finally tend toward regular bearing. Evidently, then, markedly different results may come from the same practice in different years, and nitrogen applications should be made with these possibilities in mind.

In effects on the size of the fruit two conflicting factors are operative, and apparently one predominates at times and occasionally the other. In agreement with its tendency to increase growth and the size of leaves, nitrogen has been reported to increase the size of the apples borne. This effect is by no means invariable, however; much more frequently the effects are negative, and at times the result appears to be just the opposite. It is common observation that very heavy crops frequently mean small size. Consequently the spring fertilization may increase the set of fruit to such an extent that the size of the individual apples is actually diminished. Perhaps the whole matter can be summed up in saying, that with a light crop nitrogen fertilization may tend toward an increase in the size of the fruit; with very heavy crops it may have the opposite effect. There are, however, numerous exceptions even to this rather elastic rule.

Parenthetically it should be stated that there is occasionally a tendency for inferior color in fruit grown on very heavily fertilized trees, due perhaps to the increased size and density of the foliage. It is doubtful, however, if this effect is often pronounced enough to make any material difference in the price received for the crop.

Finally, there is to be considered the question whether fertilizer applications actually increase the percentage of fruit-bud formation; whether they cause fruit buds to form on spurs that otherwise would remain barren. Recent investigations have shown that fruit-bud inception is associated with a high content of starch in the spurs late in June. Investigations just completed at the Missouri agricultural experiment station show quite clearly that, under many conditions at least, spring applications of nitrogen do not increase the starch content of the spurs in June; in fact, they tend to act in the opposite direction.

It is conceivable that under some circumstances, as in spur-bound trees in very poor soils, nitrogen applications may increase the size of the leaves enough to permit starch accumulation and consequent fruit-bud formation. In general, however, the increased nitrogen supply tends to use the starch in new growth and consequently to prevent accumulation and to cut down the chance of fruit-bud formation. In none of the various experiments that have shown increased yields from nitrogen applications has it been shown clearly that the increase has been due to an increase in the percentage of fruit buds formed.

To summarize, then, the present status of knowledge of the fertilization of apple orchards, it may be said that nitrogen is the only element to show reasonably consistent results. The gains from this element have been very great in many cases. It must not be inferred, however, that they will follow everywhere, or under all conditions in any place. When the crop is limited by factors amenable to nitrogen treatment they will be beneficial; otherwise not. The soil, the condition of the tree, the size of the crop, the time of the application, all have a bearing on these effects and should be considered. We have positive evidence that the crop may be increased by nitrogen fertiliza-

tion in some definite ways. We have no clear evidence that similar treatment has helped other processes leading to increased crops. The possibilities of nitrogen fertilization have not been fully explored. Work now under way at the Missouri agricultural experiment station indicates that new ways of increasing the crop may be practicable. At present, however, the grower should recognize that big crops are not a product of a single factor to be stimulated at will, but are the results of several factors, some of which can be and some of which cannot at present be influenced by nitrogen fertilization.

DISCUSSION.

W. B. VINING: I have understood that some orchardists in the state shipped carloads of fertilizer from Kansas City with which to fertilize their orchards. In placing that around the trees is there danger in getting it too close to them, especially the young trees? Would it make the roots grow up toward the light and sun instead of going down? Would the fertilizer be better if taken and burned into an ash and put under the trees?

PROF. F. C. BRADFORD: First, there is undoubtedly a tendency for some of the roots to be drawn toward the light. This has been tested somewhat, and it has been found that some of the roots do grow near the top, but they also are affected by weather conditions. Though the small roots are affected, it does not materially affect the trees, as there are enough roots that go downward. Second, I think unquestionably the benefits which come from the fertilizer of that kind would be totally lost by burning the manure. The minerals must be in such a condition that the plant can absorb them. There is plenty of nitrogen in the air all of the time, but the plant cannot use it. Often the plants starve in the midst of plenty.

JAMES SHARPE: Is dried blood and ground blood the same?

PROFESSOR BRADFORD: If our understanding is the same, they are the same. We use a high grade of dried blood in our experiments, ground very fine; it analyzed fifteen per cent nitrogen.

GEO. W. KINKEAD: Does it make any difference as to what time of the year you apply the dry blood, sulphate of ammonia and other fertilizers?

PROFESSOR BRADFORD: It makes all the difference in the world. As I said, the third method is to increase the per cent of apples, and this can be secured by applying it about two weeks before trees come into blossom, as nearly as you can estimate that time. Now, if you want larger trees you continue later applications. We have in some cases by application of dried blood to trees gotten a marked increase, but not consistent. What will be the effect of the nitrogen application to the undeveloped fruit later in the season I cannot say. The late freeze last Easter has put us back two years, so we cannot tell at this time. So far we recommend that nitrogen fertilizer should be applied before the blossoming.

JAMES SHARPE: What is the effect of dried blood on roots? Does it overcome the effect of transplanting?

PROFESSOR BRADFORD: I am a little in doubt as to what to advise as to use of fertilizer in the first year. It will undoubtedly have some effect, but when you come to figure the results in dollars and cents I am not convinced that we want to use any the first year.

JAMES SHARPE: Is cottonseed meal a valuable fertilizer?

PROFESSOR BRADFORD: It is valuable in place of dried blood. Understand the value depends on the availability of the nitrogen. Nitrogen can only go into the plant in the nitrate form. Nitrate of soda is good, sulphide of ammonia one step removed, and dried blood two steps removed.

THE COMMISSION MAN AS A FACTOR IN DISTRIBUTION.

W. O. ANDERSON, Topeka.

About a month ago when Mr. Whitney asked me if I would make a few remarks to your organization I hesitated somewhat because of the fact that I would have to talk my own business in a way that I surely have to, for these little things come to me one at a time. Mr. Whitney said, "you know, Billy, you folks are the worst people on earth according to the judgment of farmers in general, and I think you ought to come there and tell the people how you work it." I will acknowledge that we have that name, but I do not believe that the people who actually trade with us—and there are several of you in this room who have traded with me and other commission men—know of a better friend on earth than you have in the real, progressive commission man, whether he is a straight operator or whether he is a man who works on commission. I was very much interested in the talk on coöperative marketing by the gentleman who just spoke, and in his paper you will note that the trend of his argument on the benefits to be derived from coöperative marketing is a market. There is no better friend for the producer of any article, especially of apples, than a good market, and the closer home that market the better that friend is. Now, if this gentleman in Doniphan county could have found the same cash market right at his door that he obtained in other places that would have been better for him. This year there was a world of apples. There is no one of us who could expect to pay you for all the apples that was offered to us. We didn't have the money. And that is one danger there may be some time when all of the growers get together and put all their apples in a bunch, and all of the buyers will get together and buy their apples in a bunch; that is one of the things it is leading up to. It has become that way almost in the cattle business. I know that coöperative marketing is a mighty good thing in some instances. Now, with the strawberry business: I personally made a trip and spent several weeks in Arkansas organizing the growers of strawberries in order that they might properly pick their strawberries, grade them and pack them in shape for express shipments. I spent several weeks organizing these people in order that their berries might be marketed in the right condition. They organized and found out where markets were for their berries. Now, that is one of the things you apple growers, or growers of any product, have a right to do.

I was very much interested in Mr. Whitney's discussion of the California Citrus Growers' Association and their coöperative marketing. That is some organization. But who do they market their goods to? To the commission men alone. We are their marketing agents. We are your marketing agents. Now, the press, while it may be absolutely honest, has often come out and condemned the business man. There is no better friend to you than the business man. You haven't the time to go to the consumer and sell him a dime's

worth of apples. You haven't time to sell an apple to a man for a dime. In other words, the commission man is the distributor of your products, just the same as he is a distributor to the trade, to the consuming public and to the retail groceryman or retail stand—just one of the methods. There is no way that you can make it any cheaper. I do not believe you can put these things out in a retail way nearly as cheap to the public as the commission man does. We do absolutely a commission business, but we are usually condemned. If these things should be dispensed with—if the middleman, as the press often calls him, could be done away with, would he not have been done away with long ago? The fact of the matter is that the middleman is necessary. Take the California Citrus Growers' Association: Instead of using commission men just from the grower to the consumer, they have put two middlemen in between the grower and ourselves; instead of selling direct to us, put two middlemen in there, and the more middlemen, the more factors of distribution there are in the game, the better the producer comes out in the end. That's what they said to me when I tried to organize the fruit growers in Arkansas; told them to do it—that they would have to get an agent, and they would go on the market in better condition. They said, "that simply puts an added expense onto us." "But," I said, "you get added profits; you get something for your money." It has been thoroughly proven that those things are very necessary. The gentleman was right when he said that all growers, or rather some growers, oftentimes thought their grade of goods or their product was a little bit better than it really was. That is a fact, and the commission man has often had a mighty bad name from this very cause. Frank Dixon might come to me and leave a barrel of apples he thought was extra good grade. Perhaps I wouldn't think so; but I would say, "Now, Frank, I will take those and sell them for you; do the very best I can for you, but I do not know just exactly what it will be." I will sell them for such and such a price. Here is another man's apples of a great deal better grade, which makes Mr. Dixon's ridiculously low. I sell to Jones for \$5 and he won't pay for them. I have already paid Frank \$5, and Frank says I have robbed him. Those things happen every day. That's where the commission man gets a bad name. Any of you who have dealt with us know—I do not care who it is—that after you have dealt with certain produce men long enough you haven't anything against them. We are the best friends you have, because we are your market.

Who is the market? It is the business men of the country. You do not want to go and sell the consumer apples one at a time for ten cents. They might be delicious apples that sell on the market for a good price, but can you afford to stand there and sell one every fifteen or twenty minutes for a dime? No, you can't do it. You count the cost of this method of distribution and you will see that it costs so much you can't afford to do it. One thing in particular I want to impress upon your minds—that it costs more to-day to market your apples than it cost a few years ago. Why is that? All of the freak laws that are passed by the congress of the United States, and right in this room and other places, are detrimental to you. The people who made them thought they made them detrimental to the business men. Every dime comes off the producer of apples. Every freak law increases the overhead expense of handling that article; every dime of it has to be paid by the

producer. All of the freight rates, excess freight rates, put into effect by this country, every dime comes off the producer, and you can't figure it any other way. You may make the consumer pay more money, but the producer has to pay the excess overhead expense put on the business man. There is no other way to figure it. If it costs this man nine per cent to do business, he figures on that basis when he buys. He may buy apples for \$5 a barrel and figure it costs him ten per cent to do business. He will have to get \$6 or \$5.75; may have to take \$4 after he buys; markets may go against him—but when he buys he figures on that proposition. If the freak laws were not in effect and freight rates which are in existence to-day were lower he could buy them in western Kansas, buy them in New Mexico for so much less money; but when the freight rate costs so much you are paying it every time. The business men of this country have spent a world of money and time trying to stop these things. They have not had the coöperation of the farmers. They should have it. Why not? Because farmers do not realize it. You can't figure it any other way. They put these things in there to cause the business man trouble; but in reality, while it causes them trouble and annoyance, and they have to hire more clerks, it simply has to go in on the overhead expense. We are your best friends. What benefits you benefits us, and *vice versa*. Let us work together, then.

I will tell you some of the things I have been up against in visiting the Interstate Commerce Commission; some of the arguments that were put up. Does this hurt the producer? Does it help the consumer? 'If it does, all right. If it is detrimental to you we want to stick it on you. We tried to tell them that if it is detrimental to us it is detrimental to the consumer and producer. There are a lot of politicians that are dishonest and against the business interests of this country, because they have but one hope, whereas you have a hundred. They are trying to get you to work against yourselves. I have talked to a great many of the press reporters of this country who say they know it is wrong, because it is wrong; but it isn't popular. "We know you are absolutely right," they say, "but we can't get it put in the paper; it isn't popular." Now, those are the things we want to study about. Let us get together to cut out some of the things that are detrimental to both of us. I have a great many friends in this room and I know they will believe what I have said. I haven't been trying to boost my own business. I have been here a number of years, trying to deal fairly and trying to be on the level, and I believe that commission men as a rule are a pretty good class of men. There are mighty few of them in jail compared to the number of politicians who talk about us.

Just one more thing about commission men: One out of every five go crazy. It drives us all crazy. We start work at three or four in the morning and quit when we get through. I don't know how to get out of the business. I have a farm or two; was born and raised on a farm, but got into this game because I came here on a visit and got into the game with Frank Cope at \$5 a week, and I don't know how to get out. I believe, however, that I am in a game that is the best game in the whole country, and I have told you absolute facts so far as my opinion is concerned, and I believe I am right. If anybody desires information I will be glad to answer your questions.

DISCUSSION.

A. L. BROOKE: I want to ask Mr. Anderson if he will join with this Society to put apples where they belong as to weight per bushel—at forty-eight pounds instead of fifty.

W. O. ANDERSON: I will do all I can. I went before this legislature one time and a man said to me, "I am afraid it is against the producer." Think of it, gentlemen—afraid it would be against the producer. I did tell a man in Clay Center to go ahead and give forty-eight pounds per bushel and he might get away with it, but I was called down by your State Board of Health and told that I must not do that again. I told this gentleman that apples should not be classified as forty-eight or fifty pounds or any other weight per bushel. I do not know whether it is practical or not, but I believe it would be beneficial to you and beneficial to everybody else to name so many cubic inches to the bushel, and not say anything about so many pounds. So many cubic inches make a box; it is better for you and better for us. We sell a box of apples for a bushel. We tell them it is a bushel box, just bushel box, so established by the United States. I went before this legislature to get a standard package for a bushel, but they said it would be detrimental to the farmer—so there you are.

A. L. BROOKE: Your ideas agree with mine entirely. No two varieties of apples will weigh the same. This is what we want to cure: For instance, we sell a load of apples to a groceryman in this town, and of course he will buy them by the hundredweight or by the bushel, either one. But how will he sell them? Those apples go into the window—fine Gano apples we will say—and he will sell them by the so-called half-bushel basket. Now you know the basket will hardly hold half a bushel, even at forty-eight pounds to the bushel; but he gets the difference between the amount per basket and the weight per bushel, and he more than doubles his money on those apples, and I don't think it is a fair proposition. Kansas should not be the laughing-stock of the whole United States in the matter of weights of fruit, when they put apples at fifty pounds to the bushel and pears at forty-eight pounds to the bushel.

W. A. S. BIRD: Mr. Anderson did try to establish a standard bushel—so many cubic inches in a bushel. I think I introduced the bill. The people who opposed it, largely, were the farmers, and I am sorry to say that very often in the legislature the very people to be benefited are the people who oppose that legislation. They either suspicion something or are not educated to the standard where they really see their own interests. I remember the last session of the legislature I was in we tried to establish a standard berry box. The proposition was opposed by another representative, who said he had a friend who had already bought his berry boxes and they were below the standard we were trying to establish, and the bill was defeated simply on account of the fact that one berry grower had purchased his boxes which were below the standard we were trying to establish.

THE POSSIBILITIES OF APPLE GROWING IN THE ARKANSAS RIVER VALLEY OF KANSAS.

L. B. McCausland, Wichita.

When the subject, "The Possibilities of Apple Growing in the Arkansas River Valley of Kansas," was suggested to me, it opened in my mind a view of the possible appearance of this fertile valley twenty years in the future.

This picture of 1941 was colorful, and set forth more than one hundred miles of the Arkansas river valley in Kansas which had been made wonderfully attractive by the efforts of man. Not all of it has been planted to apples; only those portions known to possess the right kind of soil for the profitable production of apples had been used for this purpose.

It would be untrue to suggest that the entire Arkansas river valley of Kansas is suited to the growing of apple trees, and my advice to anyone contemplating purchasing land on which to grow apples is to examine the soil very carefully indeed, not only the surface, but also the subsoil, and to reject as unfit for the purpose of growing apple trees all land having a coarse, porous subsoil and land composed entirely of tenacious clay hardpan subsoil. Some of these varieties of soils are present in portions of the Arkansas river valley of Kansas.

More than 100,000 acres of land in the Arkansas river valley of Kansas are available for the profitable production of apples. Proof of this statement may be necessary. If it is, I refer you to Dr. Henry J. Waters, formerly president of the Kansas State Agricultural College; Dr. W. M. Jardine, president of the Kansas State Agricultural College; Albert Dickens, professor of Horticulture of the Kansas State Agricultural College; O. F. Whitney, secretary of the Kansas State Horticultural Society; E. G. Hoover, orchardist, Wichita; W. D. McComas, orchardist, Wichita; Ralph Dixon, orchardist, Arkansas City; E. E. Yaggy, orchardist, Hutchinson; John Alter, orchardist, Belle Plaine; Oak Nevitt, orchardist, Oxford; and more than 100 other orchardists now actively engaged in the profitable growing of apples in the Arkansas river valley of Kansas.

Returning to the picture, after this digression about soils, many acres between orchard—more than 50,000, to be exact—had been devoted to growing vegetables. Many other acres had been seeded to alfalfa and grass and other acres had been planted to forage crops to insure the production of milk, butter, and other dairy products so necessary to the welfare of this community. Comfortable, modern homes with well-kept grounds dotted the valley, and, strange to say, the cities and towns had also grown in apparent proportion to that of the rural population of the Arkansas river valley of Kansas. All this development had been caused by the decision of many of the landowners in the year 1921 to either enlarge their present acreage of orchards or else plant five or more acres of apple trees during the year 1922, continuing planting each year until their plan was completed.

If the picture pleases you, you who live elsewhere than in the Arkansas river valley of Kansas, we invite you to come and live with us and to assist in developing the possibilities of apple growing in the Arkansas river valley of Kansas. Good land at a fair price is available in any quantity you may desire to own. A good market is assured to you, because so many acres

of land in Kansas are not suitable for the growing of apples and the owners of it must look to apple-growing districts for their supply. For the next twenty years freight rates will result in placing a high tariff on apples grown outside the state, thus insuring a profit to growers in the Arkansas river valley of Kansas. I am informed that to-day the acreage in profit-producing apple trees in Kansas is much less than it was ten years ago. If this is true—and I have every reason to believe that it is—the Arkansas river valley of Kansas offers everything needed to make it the best possibility for the profitable production of apples, not only in Kansas, but also in the United States of America. Will you and your Society help make the Arkansas river valley of Kansas the apple orchard of the world? The boards of commerce and chambers of commerce of the cities and towns of the Arkansas river valley of Kansas will do everything to aid the project that you ask them to do, but your Society is the one agency alone that can originate the plan and begin the campaign. Will you do it?

DUST SPRAYING.

BERT N. JOHNSON, Kansas City, Kan.

Thirty years ago my father bought a farm in Wyandotte county which contained ten acres of apple orchard. The trees in this orchard were perhaps thirty years old and in fairly good condition. It was father's idea to make the apple orchard pay for the farm; and since his former endeavors had been along business lines, he started his new farming adventure in a businesslike way, keeping accurate account of expenditures and receipts. Well do I remember the first year's balance, which showed: Time and expense charged to orchard (mowing weeds, etc.), \$18.25; money received for crop, \$27.10. That was fairly good, but father saw that this kind of a return would not pay for the farm, and concluded there would have to be something done to swell the credit side of his orchard account. He wrote to our Agricultural College at Manhattan in regard to the subject. He was advised as to the proper way to take care of the orchard by pruning, spraying, cultivating and fertilizing, and although our next year's activities were expensive, there was a good balance on the credit side of the ledger for that year. I relate this instance in order to bring me to my subject, "Dust Spraying," which we did with good results. But our spraying equipment (a hand pump and barrel), to say the least, was slow, tedious work, as we had to haul our water quite a distance. Our orchard was hilly, making it difficult to get through with our barrel, and taking it all in all, spraying was a very unpleasant job.

We were in the midst of one of these spraying episodes when a man carrying a queer-looking contrivance under his arm came into the orchard where we were at work. He introduced himself and asked what kind of mess we were handing to the bugs. I told him we were trying to feed them a little Paris green (which was the insecticide generally used at that time). He asked me how much water we had to pump to get a pound of Paris green on the trees. I told him fifty gallons. He took the little machine from under his arm, put a pound of Paris green and a little lime dust in it as a carrier, and proceeded to spray or distribute the poison over a given number of trees,

which required about five minutes time, accomplishing the same result as to number of trees sprayed and poison distributed that would require two hours with the barrel-pump outfit. I'll say that this demonstration looked good to me, as I was getting tired of that water hauling, and I finally persuaded father to get one of the dust machines to use on one-half of the orchard, using the liquid on the other half for a check. Our results were very satisfactory on the dust plat, the apples being of as good quality as on the liquid-sprayed, with a big saving in time and expense.

It may be of interest to mention here something of the method of preparing the dust mixtures we used at the time: Paris green and London purple as the insecticide, sulphate of copper or bluestone and lime as the fungicides, were the prescribed remedies for orchard troubles. In order to use these remedies in dry form it was necessary to reduce them to a powder or dust light enough to float and adhere to the leaves and fruit. The bluestone crystals at that time could not be ground fine enough for dusting purposes, so we made a solution of the bluestone and slacked the stone lime with the solution. Hydrated lime was not sold commercially at that time. In this way the copper was incorporated with the lime, and by adding the Paris green we had a dust formula comprising all the ingredients recommended. In a year or two we could get powdered copper, which simplified the making of dust mixtures.

It was some years afterward when sulphur was heralded and used as a fungicidal agent, but almost from the beginning of my dusting operations we used sulphur in the mixture. As I increased the quantity of sulphur there was an apparent increase in percentage of clear fruit, and finally the copper was discarded.

The dusting machine was a small, hand-power bellows type that proved to be about as tiring as the barrel pump, but the job was only one-tenth as long. From that time I have been an advocate of dust sprays, and while it is not my object to knock liquid spray, I will endeavor to show that the dust process is the most practical, economical and efficient of the two methods for the grower to use.

In the matter of protection in the orchard there is but one object in view, and that is to spray the tree or plant with some insecticide or fungicide to kill the insects and prevent diseases that are injurious to the trees and fruit. The formulas used in spraying have been well worked out in our colleges and by our growers and are adopted by both liquid and dust advocates.

In liquid spray water is used as a conveyor; and in the dusting method the materials are conveyed to the tree by air directed by the force of a blower to the tree. Nature's vehicle, the air, distributes the fine particles of dust perfectly on the under as well as the upper side of the leaves and fruit. Any reliable farm hand can do a thorough job of dusting.

The question then comes up, Which method of spraying is better? In the liquid method the remedy is conveyed to the tree in water, and applied with a pressure to break the solution into a fine mist or spray. The work can be effectively done by means of spray gun or rod. The thoroughness of the distribution is determined by the thoroughness of the operator and the interest he has in making the orchard pay a dividend. If he is persistent and very thorough he may get the tree properly covered with the spray, but nine times

out of ten there will be some part of the tree that will not receive the required amount of spray, or some part is given too much.

Much improvement has been made in the preparation of dusting materials and machines for applying them. These improvements from time to time have aided materially in the results that can be obtained from their use.

In recent years spraying and dusting materials have been developed so that with intelligent use the growers can remove all guesswork in their operations to grow clean, marketable fruit. Sulphur for dusting has been developed to a fineness in texture that 98 or 100 per cent will pass a 200-mesh screen. A 200-mesh screen means 40,000 holes to the square inch. If you question this statement, count them. Dry lead arsenate has been produced in fine, fluffy flakes that is fine for dusting, and hydrated lime can be obtained from most any dealer. These materials constitute a formula that is satisfactory for general dusting work.

The formula for dusting mixtures is flexible. The proportions of insecticides or fungicides can be changed to meet the conditions without fear of injury to the trees. For the past twenty years I have depended on the dust for my protection on all the fruit grown on my farm. Dusting has given me the results I desired, at a saving of about sixty per cent over liquid spray.

In conclusion I wish to mention a number of advantages apparent to me from the use of the dust spray. I can apply dust spray to more acreage at the proper time, regardless of weather conditions or condition of the orchard soil. Too much cannot be said as to the proper time of making the application, and in my opinion it is quite as essential to spray at the right time as it is to spray at all.

The dust spray can be applied eight or ten times more quickly than liquid spray, with only half the number of men that are required to operate the liquid sprayer.

Distribution of the remedies is better, and I believe they stick to the foliage and fruit better than when applied in liquid form. There is no water to haul, and after the mixtures are once prepared they are always ready for making the application.

Remedies may be applied in any strength desired to meet the conditions. This is of particular advantage in cases of infestations such as cankerworm or potato beetles. These enemies work rapidly, and with my duster I can stop their ravages very promptly, applying sufficient poison to kill them without fear of burning the foliage or injuring the fruit.

The distribution is better. There is always untreated space in a liquid-sprayed orchard, while in an orchard that is dusted the trees, weeds, grass—in fact, the entire orchard ground are treated. No doubt this does much to reduce insects and disease.

A special advantage of the dusting method is in the control of the curculio on peaches. I control the curculio on peach, and believe that I could not do so with the liquid method, for the reason that enough arsenic applied in liquid form to kill the curculio would also injure the tree by burning the foliage.

While the cost of materials for dusting is about equal to that of liquid spray, there is a decided saving in making the application.

I use the same dust mixture to treat all kinds of fruit and berries. It is

not necessary to change the strength of the mixtures for the different kinds of fruit trees.

I am indeed glad to note that there is a better feeling between liquid and dust advocates and that the scientific workers of our colleges are waking up to the fact that it is to the interest of all to cooperate and to help one another to perfect better methods and care of orchards.

There are other growers in Kansas who have used the dust spray, and perhaps some of them are present here to-day. Since our worthy secretary has asked me to give my experience, I would like to have this subject discussed, to learn what has been accomplished by practical growers in the use of the dust spray, and whether our Agricultural College at Manhattan has conducted or expects to conduct experimental tests that would give the growers some authentic data regarding the dust-spray method under Kansas conditions.

DISCUSSION.

PRESIDENT HOLSINGER: Any discussion on Mr. Johnson's paper?

PROFESSOR KELLY: I do not care to discuss dusting at this time or at any other time. I think I have probably expressed my opinion of dusting before; but so far as the demonstration in Mr. Johnson's orchard last year is concerned, I really did not take any notes on the results that he obtained, and I would not care to make a report. The dusting, I think, has been used in the Kaw valley and in many sections of Kansas and in other states. A great many people claim that they can get good results, while others have tried it and have abandoned dusting. I have met a great many men in various sections who have once tried dusting and have abandoned it. Mr. Johnson and a number of people in Wyandotte county are still holding to it, and I think some, perhaps, in Shawnee and Jefferson counties are still dusting, but as a whole not very many of our orchard men are dusting. I was interested the other day in a conference held by potato growers, and I asked them a very pointed question—the results of dusting potatoes with Paris green or arsenate of lead that is used for dusting, and I was rather surprised. Those men told me that a few years ago a number of dusting machines were in operation, but practically all of them have been abandoned. It occurred to me that dusting, if it could be used at all profitably, would be used in potato growing; but these gentlemen informed me that they have practically abandoned it, and now use liquid spray. In other states where there is a great deal more humidity than we have in Kansas it is probable or possible that they can get very good results by using the dusting method.

A MEMBER: This subject of dust versus wet spray is one that has interested me a great deal, and I have taken occasion in traveling over the country to notice the results that have been made during the past five or six years since dusting has been brought more to the front. As you know, some of our professors at Cornell advocate dust spraying. If dusting ever becomes proven I would want to use dust, because I have 26,000 trees and it would be a big thing for me if I could use dust. Now, I will say this—that some of our big orchardists are using or keeping a dust machine ready for emergency, because we do have those things, and where we have large acreages I think it is a good thing to have a dust machine on hand in case occasion demands quick work. I believe that it is undoubtedly doing good

work on peaches. I know I have customers that swear by it and others that swear at it, so it is hard to tell what to do between dusting and liquid spray, but I believe up to the present time it is safest for us to spray with liquid spray. That is my observation from some of the largest orchards throughout the country.

PROFESSOR DEAN: I have yet to find anyone who can convince me that they can control scab or blotch by dusting. Now, I am convinced that you can control the first brood of codling moth by dusting, if it is in a locality where climatic conditions will permit of dusting; but I would like to see you use dust in places like Hutchinson, where the wind blows for six or seven days. The wind blows so hard there you can't hardly use liquid spray. There is no question in my mind that when you have a still day the dust will settle into the calyx or blossom end just as fine as you can wish for, and better than you can get a liquid spray in there, but you cannot very often get those days in Kansas. Another thing I have noticed is that we have hard, dashing rains. If dust is put on and soon after there comes one of those dashing showers, and if as much as an inch of rain falls that dust will be washed off. If the dust has had a chance to set there through one or two days it will certainly stick well. You may say that there is the same objection to lead. Not so. Lead will dry in one or two hours; and no one should be out spraying with lead during the rainy season, and lead after it sticks is hard to dislodge. For the first brood of codling moth dust is efficient, but not in a state like Kansas, where we have two broods of codling moth, and in the Doniphan district and the Arkansas valley three broods right along. Personally, I am convinced that dusting, with our conditions as we have generally over the state, is not a safe spray to use for the control of insects and diseases of the apple, and more especially of the diseases. We have plenty of examples of people who have made miserable failures with dust spraying. I also want to say this in regard to Cornell. I presume the bulletin that was issued by the university on dust spraying has done more to promote dust spraying than anything else. But some of the professors will tell you that they regret very much that that bulletin ever got out; that's a fact. What they should do is to get out a bulletin retracting the stand taken in the previous bulletin; at least they told me when I was at Cornell university that they will not back up the data given in that bulletin on dusting.

W. A. S. BIRD: We must take into consideration that the climatic conditions between Wyandotte county and Reno county are entirely different. We have more moisture in Wyandotte county than we have in Reno county. While the dust spray might be a magnificent proposition in Wyandotte county, or in the valleys of Virginia or the Potomac valley, it might be an absolute failure on the high prairies of Kansas where the wind blows so continuously. It seems to me that the arguments of these gentlemen should not be entered for or against the dust or liquid spray. In the valleys of Virginia you will not find as much wind in a year as you will find in Reno county in a week. This dust spray in Reno county may be blown into Alberta in twenty-four hours. The same dust would not blow out of Virginia in a century. We should take these things into consideration and not advocate dust sprays in countries where it is absolutely impractical. If you go into some of the valleys of Washington and Oregon where it is very quiet at times you will find they

use a great deal of dust spray. In the Ozarks they use it to decided advantage. Go into New Mexico and west Texas where they have a great deal of wind and the dust spray would be in Canada in a short while.

BLISTER CANKER AND APPLE BLOTCH.

WILLIAM FREIENMUTH, Tonganoxie, Kan.

Of all the enemies the orchardist has to contend with apple blotch is probably the worst and most dangerous. The loss in the value of the fruit caused by blotch is in itself very great, but worse than this is the damage done to the orchards—the killing of the trees. The danger that apple growing will be made impossible in this part of the country unless the disease is checked is evident, and I think everybody will agree that it is worth while to try our best to suppress this pest, or at least get it under some control.

While I do not claim any scientific accuracy in what I am going to say, still I believe I have studied this matter closely enough to have come near the truth. It is a serious thing with me as well as with any other orchardist, and if we would save our business we will have to get down to work; yes, work—and work harder than ever for awhile.

Blotch seems to be a disease caused by parasitic spores of fungi that choose apple trees to live on and reproduce themselves. Wherever these spores have found entrance in or under the bark of a tree there will be found a brown, leather-colored spot that slowly spreads, killing the bark. When the bark is dead, but before it is dry, there appear a great number of small blisters, which soon will burst and release the spores that grew there, which are the seed of the blotch fungus. These spores will be carried by the winds everywhere, and some will get to the young apples and take root and grow there—the cause of blotch. I do not think that this fungus reproduces itself on the apples; at least I never could see any signs of anything of that kind.

One often finds the roots of a tree affected in connection with the cankers on the limbs. I'm not clear on the question whether there is any connection between the two, and if there is, in what way. I believe, however, that where a tree is already diseased it is more liable to attack by canker.

When the United States undertook to dig the Panama canal the greatest problem was the freeing of the canal zone of malaria and yellow fever. Colonel Gorgas, in charge of the sanitation work, knowing that both diseases were carried by infection from mosquito bites, concluded that the best way to prevent the disease would be to eliminate the mosquito by doing away with their breeding places. It was a man's job all right, but he did it most effectively. Apple blotch is caused by an infection of the apple with the spores of a fungus, and it appears reasonable to suppose that the elimination of these spores, or, in other words, the prevention of the breeding of them, would at once stop the trouble.

The fight against blotch has up to this time been limited to an attempt to protect the young apple skin by keeping it covered with a fungicide, and this has not often proved very satisfactory, which is easily understood if we consider all the factors at work against success. Consideration of these things led me to undertake an experiment which I believe will prove at least a step in the right direction—the elimination of the cankers.

The work of cleaning out the spore-producing cankers was started in connection with tree pruning in the fall of 1919. The smaller diseased limbs were removed. On the larger limbs and on the trunks of the trees the affected bark was cut out with a tool made on purpose for the work. This part of the work has to be done very carefully and thoroughly so as to cut all of the diseased tissue down to the white, clean wood. One often finds under the seemingly sound bark the discolored inner bark extending up and down the limb for quite a distance, and if this is not carefully cut out it will start a fresh canker. All the wounds are then disinfected by painting over with a disinfectant. The disinfectant which we used is made by dissolving one-fourth pound of copper sulphate in one gallon of water with some slacked lime added. This is the principal and most important part of the whole job. In the spring, in March, we put on a spray of five gallons standard lime-sulphur to fifty gallons of water. This is a very disagreeable job, and it has to be done carefully so as to cover all parts of the tree with the spray. After this the usual seasonal sprays are put on. The object of this winter spray is to kill any of the spores that live through the winter which may be lodged anywhere on the trees.

Now, when we come to consider the results of this first trial we must bear in mind that the work was done under very unfavorable conditions. The orchard we treated is an old one, twenty to twenty-five years old, badly infected with canker, which has already killed at least thirty-five per cent of the trees. For the last few years the apples were badly spotted with blotch, a large percentage being unsalable. Missouri Pippin had not matured an apple for years, and a No. 1 Ben Davis was a rarity. The past season was a poor one for orchardists in our district. I think we got barely twenty per cent of a normal crop. What apples we did get in our orchard showed very little blotch, much less than what we found in other orchards in our neighborhood. We found four-fifths of the Ben Davis free from blotch and well grown, and even a few Missouri Pippins were perfectly clean. When we commenced pruning this fall we found few new cankers, and those treated last year had mostly started to heal. Some few that had spread farther evidently had not been cut out sufficiently. A few trees had died during the summer—probably too far gone to respond to the treatment.

On the whole, a very satisfactory improvement was shown in the quality of fruit and condition of trees. It seems practically impossible to find all the cankers on large, old trees in one pruning season, and one cannot, therefore, expect complete success at once; but I believe that the described method will in a short time free an orchard of canker and prevent blotch if it is generally practiced. And if it should be scientifically demonstrated that blotch is a different disease than canker, the treatment here recommended would be no less effective, and in any case should be given a thorough trial.

But here is where the trouble will be: The owners of large orchards who are making fruit raising a business will do what needs to be done to make the business a success, but these small home orchardists will never put in that much extra work in order to get a few apples, and any of those neglected trees will always be a source of infection to a considerable distance.

Unless there is found a way to make sure that these small orchards will be properly taken care of it seems unsafe to encourage the extensive planting of

such; otherwise there is sure to be nothing but failure and disappointment, as the experience of the last ten or fifteen years has plainly demonstrated.

The importance of this matter seems to justify my wish to bring it to the attention of everyone interested, even if the correctness of my claim has not been positively established.

DISCUSSION.

PRESIDENT HOLSINGER: Mr. Freienmuth has given this subject some attention, and I think we are very fortunate to have him here to enlighten us. I know that blister canker is of sufficient importance that it ought to be discussed here.

A. L. BROOKE: There are many things about horticulture that we think we don't know about, but this is one thing we know we don't know anything about, and if Mr. Kelly knows anything that we don't know about it I would like to hear from him.

PROFESSOR KELLY: I beg to be excused. We have been studying canker for several years. I think Mr. Pyle has been very successful during the last ten or twelve years in holding some of his trees, his old trees, and I know others who have attempted to cut trees back. It is a fact that it is one of our biggest problems in orcharding. One tree can get blister canker and every tree in the neighborhood will have it in a short time. It is probably disseminated by pruning shears and saws and in a dozen other ways, and we know that it has spread and has taken out some of our most valuable orchards. I think Mr. Freienmuth is to be congratulated that he has attempted to dig into the problem. He has learned a whole lot, and the suggestion that he has made of possible relation between blister and blotch may lead us to something we may be able to control. I do not know of any relation, so far as I am informed, between the two diseases, they seemingly being entirely different, although they may be closely related.

PROFESSOR DICKENS: To take up the thread of thought that Mr. Kelly was working on, it seems to me from the fact that blotch and blister canker have been particularly serious in the same varieties has a possible relation in weakening of the tree by the injury to the trees by the blotch, and has possibly made the Ben Davis and Missouri Pippin more susceptible to this fungus. Perhaps as good work as has been done anywhere in the control of blister canker has been done in Frank Pyle's old orchard near Rantoul. At the time he took the orchard, twelve or fifteen years ago, the canker had made serious inroads into the Ben Davis, Missouri Pippin, Winesap, and possibly two or three other varieties, and perhaps he did the most heroic tree surgery that has ever been done anywhere, and most successfully. That orchard is there to-day as a witness that it is worth while to fight for the life of the Ben Davis tree that is badly affected. With a crosscut saw he cut out large sections of those trees and found that it was worth while and that it paid.

JAMES SHARPE: With regard to the connection between blister canker and blotch, it seems to me that blotch was common here many years, but we had not discovered and had no knowledge of any such thing as blister canker, and I do not see how the diseases could have any connection with each other. I have been doing some trimming this year, and we cut out some blister canker. I noticed that in most cases it is, or seems to be, in the larger limbs and runs down into the body, and I think disinfecting the small limbs is unnecessary.

It is in the larger limbs, and I think it could be remedied by cutting it away, going well down below the infection; but I believe that unless one does go well down below where it shows any on the sapwood or in the bark, you will never get rid of blister canker, but so far as the two diseases being connected, I cannot think that they have any connection whatever.

PROFESSOR DICKENS: I had no intention of suggesting that the diseases are identical, but I believe they have a tendency to cause a weakening of the tissues, from the fact that we find it on the Missouri Pippin and Arkansas Black. One orchard near Manhattan we had observed quite awhile. We did no work in it for a number of years, but one axman who trimmed trees in that orchard infected practically the whole orchard, and blotch weakened those trees more than most any other variety we had observed, and Missouri Pippin and Ben Davis had been badly weakened by blotch after this pruning, and then the canker made short work of it. In another orchard near by that had been fairly well cared for and the blotch had been controlled a number of those trees are still there doing good work, whereas the other orchard went to pieces with canker.

PRESIDENT HOLSINGER: Mr. Freienmuth stated that he thought there was some close relation between blister canker and blotch. It was his contention that there was some close relation between the two and the control of one would largely control the other.

WILLIAM FREIENMUTH: I have noticed that outside of the growing season they are not nearly as liable to develop canker as during the summer. I try to prune in the winter before the sap commences to run; that gives the wood a chance to dry. I believe that if the wood is dry outside it is not liable to be infected with canker. On the other hand, I had an orchard that the cows run in, and the cows naturally ate the ends of the limbs, and nearly every one they could reach developed canker in a very short time. This shows that it comes in the wet wood; it starts where there is a wet spot nearly always. Now, of course, even if there are no wounds made during the summer there can be wounds that naturally occur. You will often notice that cracks develop in the bark during the growing season; this opens wounds for the spread of the disease. That matter about cutting affected limbs out I think it ought to be tried. It is effective. I know it is, because I have tried it. Some trees are much more liable to be infected than others. Ben Davis, Gano, Missouri Pippin and Winesap are quite susceptible to the disease. Ordinarily the Winesap is not liable to be infected. We ought to cut out those trees that are susceptible to it. Of course I know the Ben Davis and Gano have been the best-paying apples—the best that you could plant, but there is no use planting them now.

A. L. BROOKE: Now about the blotch and canker, I will just say that the Ben Davis and Gano varieties seem to be affected with it; but what are you going to do when it gets to the Maiden Blush? There isn't any apple much more susceptible to blotch than Maiden Blush, but you hardly see a Maiden Blush with any canker.

JAMES SHARPE: The early pruning suggested by my friend here, which is contrary to all our past business, is one of the best preventives against the blotch, and for that reason I have already trimmed my orchard. As far as

cutting is concerned, it is all done; I did it with that in view. By the time spring comes, when the insects are flying around, the trees will not be in condition to be affected. I believe in early pruning.

The following by D. E. Lewis, in the Encyclopedia of Practical Horticulture, is a complete definition as to blotch. The treatment recommended is one practiced by successful orchardists:

BLOTCH.

(*Phyllosticta solitaria*.)

The blotch is caused by a fungus which lives parasitically upon the fruit, twigs and leaves of the apple.

The apple blotch frequently causes over 90 per cent of injury to susceptible varieties in the Central West. It has been successfully controlled on the fruit, the first season sprayed by the application of Bordeaux mixture.

By the continued use of Bordeaux during successive seasons the disease can be almost completely eradicated from the orchard in from four to six years. The 3-4-50 Bordeaux can be safely used if made and applied only as recommended.

It is especially necessary in the control of this disease that the spraying be done with absolute thoroughness and at the time indicated in the schedule.

Lime-sulphur solution is less effective than Bordeaux mixture for blotch control, but should always be used during wet weather on account of the tendency of Bordeaux to cause injury at such a time.

The work of eradicating the blotch fungus can be hastened, the chance of injury lessened and the commercial value of the fruit increased by carefully cutting back the affected trees.

This cutting-back process strengthens the framework of the tree and throws it into vigorous growth. Advantage may be taken of this growth to increase and lower the bearing surface of the tree.

(Another practice lately used is to supply a dormant spray consisting of one gallon concentrated lime-sulphur solution of 32 Beaumé test to five gallons of water. This spray must be applied when the tree is dormant.—Ed.)

SCAB.

(*Venturia pomi*.)

Apple scab is the most serious and most generally distributed fungous disease of the apple.

SYMPTOMS.

Apple scab attacks both foliage and fruit. On the foliage the spots are at first more or less circular in outline, olive green or brown in color, becoming darker and more irregular in shape as they become mature. The leaves are frequently more or less curled or wrinkled. When the spots are abundant the leaves fall prematurely and considerable defoliation may thus take place when infestation is abundant. This may result in a failure of the fruit buds to develop normally and so affect the amount of the crop the following year.

On the fruit the fungus produces more or less circular spots of a greenish-black color. The vegetative stages of the fungus causing the disease develops under the cuticle of the apple fruit, finally rupturing it by elongation of the threads which bear the spores. The ruptured cuticle may frequently be seen clinging as whitish membranous shreds about the edge of recently developed spots. As the spots become old all trace of the fungus may become obliterated and the only evidence of the former spot is seen in a large or small, rough, russeted spot. Frequently the fruit is distorted when mature as the result of early scab infections. Where scab spots are abundant the fruit may become cracked.

TREATMENT.

As with all fungi of this nature, treatment must be preventive rather than curative. The method of treatment is dependent on the life history of the fungus causing the disease. Since the fungus winters over on the fallen leaves, it would be advisable to destroy all such leaves before blossoming time. The usual recommendation is to plow the orchards early in the spring before the trees blossom, in order to bury the leaves in which the ascogenous spore stage is developed. Theoretically, the best way to destroy the leaves would be to rake and burn them before plowing, but pathologists have hesitated to make this recommendation on the grounds of impracticability.

In any case the trees should be given at least three sprayings during the spring. The first application should be made as the blossom buds begin to separate in the cluster and show color; the second should be applied just after the petals fall, followed by a third application ten days or two weeks later. Should the third application be followed by prolonged rains, a fourth may be found profitable.

Formerly Bordeaux mixture was used almost entirely as a preventive of scab, but in certain sections of this country, notably under the climatic conditions prevalent in the Northwest, the injury from russetting has been so severe as to make its use prohibitive. On this account lime-sulphur has largely supplanted Bordeaux as a remedy for this disease.

SPRAY DISCUSSION.

SECRETARY WHITNEY: Mr. Kinkead, do they spray Doniphan county orchards?

GEORGE W. KINKEAD: Yes, sir. We have several power machines, the best machine we can buy. Last summer we sprayed six times in most of our orchards. We have the same conditions up there that you have here, and have the codling moth, curculio and lesser apple worm. The aphid bothers us some. The fungous diseases are the scab and blotch; they are the ones that bother us the most. We are not bothered a great deal with blotch; still there is some blotch around Troy. We have been using lime-sulphur liquid spray, and have been putting on dormant spray just before the buds open; we do that every spring. Then put on a spray called the cluster-bud spray, that we put on a little stronger than the College advocated. Then we use a liquid spray, arsenate of lead in dust form, and also the Rex New Form. We

spray with lime-sulphur a few days after that. If codling moth are coming out we put on arsenate of lead spray or Bordeaux or liquid lime-sulphur, and then about two weeks after that we put on another spray. This summer I think it paid us. We put on a July spray and then we put on an August spray, and we controlled the moth and the worm. The fruit is practically clean of worms, but we had some fungus. We had a very wet, cold spring, and it developed scab, which is hard to fight. We put on lime-sulphur liquid, but there was so much wet, cloudy weather that we had some scab anyway. We did not lose a great deal; I would say ten to fifteen per cent.

PRESIDENT HOLSINGER: Any further discussion on spray materials?

F. W. DIXON: Powdered lime-sulphur, in my experience, has not been as effective as liquid lime-sulphur. On one or two orchards we didn't get any results at all from using powdered lime-sulphur. The liquid has proven to be the best, but I do not like to handle it as well as the other. It mixes better and is better to put on. I used the powdered arsenate of lead for codling moth, and it always cleaned them out.

PRESIDENT HOLSINGER: Mr. Vining, have you ever used powdered lime-sulphur?

MR. VINING: No, sir, I have not; but I have seen orchards where they used it, but I do not believe they have as good success with powdered lime-sulphur as with the liquid.

PRESIDENT HOLSINGER: Professor Dickens, what is your experience?

PROFESSOR DICKENS: The last three years we used liquid and powdered sulphur, and sulphide, which is another new spray material that we have been asked to test, and in every case the liquid has given us the best results. The scab was controlled almost perfectly with the liquid lime-sulphur, while there was not more than a thirty to forty per cent control with the dry lime-sulphur and not more than a thirty-five or forty per cent control with the sulphide. I know one young man who has an orchard between St. Joseph and Kansas City who feels he has had very satisfactory results with dry lime-sulphur, but in our tests both at Manhattan and in the orchards of the state we cannot recommend the dry lime-sulphur as being as effective as the liquid. As a matter of fact, we have not had satisfactory control of blotch without the use of Bordeaux mixture.

GEORGE W. KINKAD: Can we control scab with Bordeaux?

PROFESSOR DICKENS: Yes, but it is dangerous. We first spray with cluster-bud spray, which is all-important in the control of scab. The weather conditions would determine always whether we would use Bordeaux mixture or the lime-sulphur in that cluster-bud spray. The cluster-bud spray is particularly dangerous and liable to burn with Bordeaux mixture at that time. Those cluster buds are very tender, but we have had some wonderfully good results. Lewis, of the Central States orchards, had good control of scab—I think it was in 1915—with the use of Bordeaux mixture. The spraying was followed by a week of fine weather. If the weather had been cloudy and cold I am wondering what they might have had in the way of burn. The burn is a very serious matter. You can control scab with Bordeaux mixture if the weather is right.

PRESIDENT HOLSINGER: Is that the time most of the burning comes—from early spraying?

PROFESSOR DICKENS: No, you would not notice any burns showing at that time.

PRESIDENT HOLSINGER: If injured in that early state they would drop?

PROFESSOR DICKENS: Yes, sir; probably fail to open.

MISS NILES: I would like to ask if anyone has figured out how people with these acre orchards are going to get together for spraying. They cannot afford a machine, and is there any community way of getting it done?

PROFESSOR DICKENS: I am sure anybody with an acre orchard can afford one of those barrel pumps. They are useful in spraying hogpens, chicken houses, and \$40 or \$50 isn't too big an outlay if one expects to have an orchard. The repairs on our machine have not been over two dollars for the last sixteen years, and it looks like it is good for sixteen years more.

SECRETARY WHITNEY: It does not take an elaborate outfit for the spraying of a home orchard. You need a sprayer on the place anyway. There is the poultry house that needs it. You can paint fairly well with it. A barrel spray will handle this acre orchard and handle it nicely. It takes a little hard work, perhaps, but it is a great deal easier than to get the engine started sometimes. It is a simple thing, and nearly all of these spray men put out a spray calendar which you can read, and you can't miss it very far if you follow that. Perhaps if you are spraying a commercial orchard you ought to be better posted than you are with the home orchard, but I would not let this matter of a spraying outfit deter anybody, because a barrel sprayer is nearly a household necessity.

GEO. W. KINKEAD: In contemplating the question of spraying for the beginner, I would say we must consider how, when and where. We spray in our county with the best machinery and the best spray materials we can get, and the best is none too good. We generally use a Bean or Hardy triplex three-horsepower machine, two leads of hose, two guns, and a tank that holds not less than 200 gallons. We aim to cover the trees completely. We emphasize from start to finish that we must do our work thoroughly. We make that feature very important.

We begin in the spring with the dormant spray. Usually we put it off as long as possible, applying the spray just before the terminal buds show green or the clusters start to open. We use one gallon of lime-sulphur to eight gallons of water. Some say that is not strong enough for the dormant spray. We will try it with one gallon of lime-sulphur to five gallons of water and note results. While that is quite strong and expensive, it will pay big dividends, if by so doing we can control blotch. We use the concentrated lime-sulphur solution, 32 Beaumé test; not the powder. By use of the dormant spray we hope to control San José scale, oyster-shell, green aphid, and probably some curculio. We buy our spray material early in the fall from reliable companies, have it shipped in the fall, store it in cellars or bury it to prevent freezing. If we have it on hand it eliminates all risk of not getting it when the time comes to spray. For poison we use dry, powdered arsenate of lead almost exclusively.

After putting on the dormant spray, the next spray is known as the cluster-bud or pink spray. We apply this just as the clusters open and before the blossoms unfold. We use plenty of arsenate of lead, about 6 pounds to 200 gallons. This is some stronger than is usually advised, but we have never

suffered any loss from using it at that strength, and believe that we have been materially benefited. With this spray we also use 6 gallons lime-sulphur to 200 gallons of water, thus making the combination 6 pounds of arsenate of lead, 6 gallons lime-sulphur to 200 gallons of water.

The next or third spray is the petal-fall spray, which is applied when two-thirds to three-fourths of the petals have fallen. One object of this spray is to get sufficient arsenate of lead into the calyx cup of the apple that it will destroy the small apple worm, which is the larva of the codling moth. Another object is to control apple scab. We use the same formula in applying this spray as we did for the cluster-bud spray.

We cannot prescribe a fixed date for applying the next or fourth spray. To ascertain the proper time we have confined the larvæ of the codling moth in little wire-screen cages throughout the orchard, some in low places and others in high places. We try to disturb the larvæ contained in these cages as little as possible. We keep a close watch on the cages, and when the moths are out and ready to lay their eggs we are ready to spray. We use about 6 pounds arsenate of lead with 3-4-50 Bordeaux mixture, or the same number of pounds of arsenate of lead with 6 gallons of lime-sulphur to 200 gallons of water. This spray is put on according to the insect life or fungus that may develop. When we see the codling moth out we know it will be just so many days after that before the eggs will be laid, and just so many days after that that the eggs will be hatched. If cool and damp we use lime-sulphur to quite an extent, but we try to not use it too strong. Two years ago the fruit from a block of apple trees in our country was ruined by the use of lime-sulphur applied when the weather was too hot, spray-burn was the result. Blotch and scab are the two great fungi to be fought at this time with Bordeaux and lime sulphur. We endeavor to have the poison on the leaves and fruit as soon as the chewing insect is ready to take its first meal. Then we put on a spray—the fifth—about two weeks later, continuing about every two weeks through the summer until we have sprayed six or seven times. If green aphid appear we add one and one-half pints black-leaf 40 to 200 gallons. We do not use lime-sulphur in hot weather. Perhaps we spray more than most orchardists do. We think it pays. The entire brood of the codling moth does not emerge at the same time. Our summer spray is to catch these later broods and to kill or control fungus, spores of which seem to be always present and active.

W. B. VINING: Who made the first codling-moth cage?

GEORGE W. KINKEAD: A man in Colorado, at Grand Junction. It was used in Illinois five or six years ago, but that cage was primarily for catching the worm. Forbes made a cage that covered the entire tree to observe the larvæ, and from that determined what he could about the dates of hatching, etc., but that was too cumbersome, and only in one place in the orchard. Then a cage was made three feet square, covering a part of the tree, and later was made to the size now used. I think William Martin was the first one to make one six inches long and four or five feet wide, in 1917; it was used quite extensively in the Arkansas valley. That year he was able to determine quite accurately the dates of the issuance of the worm.

E. H. NOLTE: In talking to horticulturists I take it for granted that you understand and are experienced in spraying and know the value of it. There is one field for the commercial orchardist, which is large; he knows the need

and studies the method of spraying. One of the greatest needs we encounter is for the manufacturer of material to keep in touch and keep up with the colleges and those who are experimenting and giving results. Mr. Kinkead in his remarks spoke about using the best machinery, and I think he sounded the keynote of spraying by using the word the "best" as applied to spray material and spray machinery. Efficient results are what you are striving for. So often the adjoining orchardists are not up on spraying, and you cannot control their orchards. You cannot control the weather conditions or the reaction of the spray after being put on, nor can you always control the machinery; but you can control the material you use. That depends upon your own judgment. I urge every grower to satisfy himself that he has the best type of machinery he can get, and the best spray materials. The responsible manufacturers of spray realize their responsibility and are striving to the best of their knowledge to provide the best and most satisfactory sprays. The manufacturers are doing their best to increase the efficiency and the uniformity of spray materials and to simplify the material as best they can, because the better they can satisfy the grower the better for their business. The main articles for spraying are arsenate of lead, lime-sulphur and Bordeaux. Arsenate of lead is used in different forms. Lime-sulphur is used all over the country as a spray for scab and blotch and as a control for San José scale, and is also of value in controlling other diseases. It is now uniformly used. Bordeaux is a fungicide, and as such is well known. The commercial manufacturer of sprays is doing his best to get good material that is absolutely dependable and safe to use. His idea is to try and combine the two important factors, efficiency and safety. We invite your attention to the Bordeaux material that the commercial manufacturers are putting out for this year and satisfy yourself as to its value. You know the difficulty in making Bordeaux and getting it uniform, and the advantage of buying the materials already prepared is that they are uniform. I heard of a man last year who made his own Bordeaux, down in the Ozarks, with very disastrous results. He made it according to the formula, and it was all right as far as the formula was concerned, but he could not mix it so that it would react as it should. You are protected in the formula in that the United States government compels every manufacturer to meet those conditions, but the condition of the materials is more important than the formula. I mean you can make any of the mixtures according to the formula, but still they will not promote efficiency. It does not take much spray to kill an insect, but you want it widely distributed to get all of them. The Bordeaux and the lime sprays that the manufacturers sell are uniform. Our Bordeaux is a valuable insecticide, and you can be sure that one package is the same as another. You who have made Bordeaux are familiar with some of the difficulties. There are other points I wish you would consider also—the price for one. You must bear in mind that the manufacturer must sell his Bordeaux or other spray material so as to make a profit. I speak for my own company and for no other, and say that the business has not shown the profit that others think it has. We hope to work together and keep abreast of your recommendations and improve the material as you say it needs.

A MEMBER: At what temperature can we use lime-sulphur without injury?

E. H. NOLTE: We know you can use ours at almost any temperature—ab-

solutely safe at less than zero weather. I am not able to state just what temperature will be safe for liquid lime-sulphur. We believe our dry lime-sulphur we are about to turn out will have a wider range of temperature than it has had, and we feel sure that the dry lime-sulphur will do just the same as the liquid lime-sulphur. On that point you can satisfy yourselves, and we think there is no advantage of the liquid over the dry.

E. G. KELLY: We have been using a spray one to eight, but we have had no experience in using it one to five. Mr. Sharpe does control blight with one to five, but there is one thing we must take into consideration, and that is that there is no other orchard within twenty-five or thirty miles of his orchard, and so he can get control of it easier. With an isolated orchard one can get control of diseases; but with an orchard in the midst of others, and for one person only to spray, he cannot control all diseases with any spray. We have worked out a spray schedule at the College and have it printed on little cards; but I want to say that I think no orchardist would be an orchardist if he followed that card. We have demands for information on sprays, and that we can quickly send out information we have prepared these cards. They are for the little home orchardists over the state. Those men do not know about spraying and will not give it any study. We do not encourage the orchardman to follow this schedule. He will get as much out of his orchard as he puts into it, and he knows it. I was much interested in Mr. Kinkead's remarks about the codling moth and the different sprays at the different stages of the life of the moth. The more we study this question the better will we be able to control it, but it is still a problem for the orchard grower.

GEO. W. OWEN: We always try to make improvements in sprayers. One of the improvements we have made in manufacturing is in the Hardy spray machinery. We are always trying to keep up to date and up with the insecticide men and change the machinery as often as they change the sprays. As soon as we get one fixed up they have a new kind of insecticide, and we find we have to put a different kind of metal in our valves. We are trying to keep along with these men, however. In certain sections of the country men use material with a lot of sand in it, and that cuts the valves out, so we have to guard against this by putting in a fine screen to take out the sand and settlings. It keeps us constantly changing the metal used in valves and other parts, but on the whole we get along very nicely with the growers. If the men in spraying will just clean out the most important parts every day we will have no trouble, and their pumps will not get clogged. Men used to be satisfied to use a hand pump; then they wanted something that would do more work and cover larger areas, so we made a larger machine. Then they wanted one still larger, and now we have a ten-horsepower machine. I expect we will have to have a fire engine next. Then you went beyond the liquid spray and tried dusting, and we had to contend with that. Now you are demanding of us something that will do the work immediately, and we will furnish that. In war times spray rods were used instead of guns, and that saved a lot of time. We find, the country over, the rods do as well as guns. I have just come from the western slopes of Colorado and I found that they had gone back to the rods. They have to keep spraying constantly against the codling moth. They spray eight or nine times. They have mostly small orchards, five to ten acres. They also have to irrigate. In Kansas it seems

that for the last two years sprays have not been of any value, especially following such freezes as you had on last Easter Sunday. We are doing our best to keep up with you folks and work for your good as well as for our own, and we try to change our machinery to fit the needs as developed by the experiments of the college men. We try to do this cheerfully and with smiling faces.

NEEDED LEGISLATION FOR HORTICULTURE IN KANSAS.

C. S. RITTER, Iola.

Kansas has enough suitable land for horticulture to produce enough fruit to supply the state and a surplus for less-favored regions. Our location is favorable for the production of new varieties. It is within the memory of the generation of men now here that Kansas produced only native strawberries and gooseberries, wild grapes and plums, persimmons and black haws, where a few years later grew the apples that captured the gold medal at the Centennial Exposition.

And twenty-five years later a collection of apples and other fruits exhibited at New Orleans brought to Allen county the grand prize awarded for this fruit exhibit. To B. F. Pancoast, for more than a third of a century an honored member of this Society and of our Allen county society, belongs in a great measure the honor of collecting this display that captured the prize at New Orleans.

On November 3, 1897, the American Institute, held at New York city, awarded its diploma to the Allen County Horticultural Society for a collection of seventy-four varieties of apples, all grown in Allen county. Much has come to pass since that early day when we were warmed to our work by the fires of enthusiasm. Those old orchards are gone.

The absence of fruit from the family table is sometimes supplemented by the women folks buying a limited supply from the corner grocery out of the egg money, and the old man roars about the high price, but that is all he does toward furnishing a supply of home-grown fruit. The fact that I wish you to see is that the last half of the older generation and most of the new generation have neglected to plant fruit trees and neglected to take care of the old trees that brought so much pomological glory to Kansas.

Fruit growers of Kansas have given to the world many new varieties that, following the path of legend, have more honor in other lands than in their home state. A list of apples originating in Kansas, published by the United States Department of Agriculture, contains thirty named varieties. Of these varieties Stayman's Winesap is probably the best known, but many others are pippins, in the popular meaning of that comprehensive word.

Of the many new varieties of strawberries introduced to the world by Kansas, perhaps the Aroma is well in the lead for popularity as well as quality.

The Kansas, a blackcap raspberry, took a place in the front in the raspberry class almost before it was old enough to be away from home alone, and has maintained its superiority against the claims of all competitors. The flavor of that wonderful purple berry, the Cardinal, has never been excelled by any hybrid raspberry introduced. These two berries were originated in

Douglas county and introduced by A. H. Griesa, a lifelong member of this Society.

The Superb apricot is the only one of its kind that claims Kansas as a home state. Its originator says of this variety of fruit that it must be grown at home and served fresh from the tree to be fully appreciated.

The Kenoyer blackberry was first fruited in Independence by F. L. Kenoyer, its originator.

The Douglas pear needs but to be given an opportunity to prove that it is a class of itself.

Franklin county has a new crab, the Johns. It is likened unto a small Jonathan apple. Nothing more need be said in its favor.

With a growing demand for grapes, the field for propagation of new varieties is wide and the opportunity for success more than 50-50.

This state is a pioneer in legislation to aid the efforts of its people at production as well as in moral welfare. Commissions, boards and courts are created, consolidated or divorced whenever the legislators believe that such a course will best serve the interests of the state. Of the 11,842 sections of the General Statutes, eight sections have to do with horticulture. Section 10386 recognizes the existence of said State Society by providing that it shall have rooms in the statehouse in which to store its archives, trophies, diplomas, books, papers, reports and other property of the state pertaining to horticulture, and further provides that the Society shall collect and distribute statistics and information pertaining to horticulture and shall compile and issue reports.

The act of 1903 recognized the distinct identity of the Society by providing that the State Board of Agriculture be relieved from any of the duties relating to horticulture which it had been performing. So it may be treated as settled that the state recognizes horticulture as one of the occupations of its inhabitants that is worthy of being fostered and aided by statute and that it is a separate producing science that is entitled to recognition independently of any other science or business.

I will now argue a more liberal system of aiding horticulture in this state by legislative enactment. There may not be a magic key to unlock the law of nature that will keep peach buds from swelling in the fall, under the benign smiles of a Kansas autumn sun, to where the annual Easter blizzard kills them; but there is a magic word that will inspire horticulture in Kansas into a new life that will bring back the glory of past decades and add new trophies to the triumphs achieved by our pioneers in the orchard and vineyard. That one word is *organization*. Under its banner armies are created; governments are instituted, and order follows chaos; savagery yields to civilization; ignorance is dethroned and knowledge enlightens the life of man. Through organized effort the Great Plains were rescued from the dominion of Indians and millions of homes created by a superior race, and the mountains yield their stores of mineral wealth for the advancement of human happiness.

An organization that reaches the grower of codling moth, curculio and blotch and brings him out of that class into the company of modern fruit growers is essential. The nearest panacea for these growers of moth and blotch is a carefully organized local horticultural society with from four to six

regular meetings a year, with special meetings occasionally. Hold these meetings in the country, on the school grounds, in the best-kept orchard, or the home of a member; these are all ideal meeting places. The horticultural home on a city lot is also an ideal place to hold such a meeting. The program should always have a picnic dinner on it, whether the meeting be in town or on the farm. Exchange of views and experiences should be the program, in the main. Bulletins and horticultural reports furnish plenty of technical information. Let the members tell how they did it rather than what to do. The fact that it is to be a horticultural society purely is of great importance. Do not mix anything else with it. The usual presiding officers and secretary and treasurer should have charge of the general work. But a board of trustees for every county society is even more necessary. To them falls the duty of providing meeting places and of arranging a program and assigning the numbers to those who will do the part assigned.

So far the plan under discussion embraces local and county societies. The state already has a Society with a history for doing good that is not equalled by any kindred organization. Beginning when the smoke of battle that united the latitudinal sections of the nation had only cleared from over the land, and working on through the years of droughts and grasshoppers, windstorms and floods, political downfalls and civil upheavals, asking little and doing much for the state, never a burden and always an asset, this Society cannot be improved on. Any bill to legislate the State Horticultural Society out of existence must fail. Whatever new legislation may be enacted to further the science of horticulture in Kansas must rest upon and be a continuation of the work of this Society.

The membership of the State Society should be composed of its officers and such members as are selected in accord with the constitution and by-laws of the State Society, and delegates from county societies. The term of membership of delegates from county societies should be one year. Their duties should be such as are provided by statute and by the by-laws of the State Society.

The pleasure and honor of membership in the State Society should attract and hold the leaders in fruit growing and nursery productions as members of the highest organization of one of the noblest of man's occupations.

Every fruit tree, every grapevine, every fruit-bearing bush or vine adds to the food supply of the state and becomes a valuable asset. Money sent to other states for fruit must first be made at some other occupation. Loss of initial capital in paying freight, handling charges, too many profits, all are a heavy drain that the consumer must pay to get a needed, nay required, supply of fruit. Why not foster its production right here at home by aiding local and county organizations of fruit growers and broadening the scope and field of the State Society.

No attempt has been made in this paper to cover the ground of the subject except to try to point out a scheme of organization that has in it the leavening that arises from the enthusiastic work of the few devotees of the science that is to be found in every locality, and provide a vehicle to carry that enthusiasm to others who may be interested in fruit growing. That vehicle is the local society, made up of neighbors.

It has been stated elsewhere in this paper that the magic word to accomplish the purpose of this society is organization. A fit conclusion for it all is found in the language of the poet whose inspiration found vent in these words:

They who by their business would rise
Must either fail or organize.

MISS NILES: I would like to have a definition of horticulture. Is it the growing of fruit or flowers?

C. S. RITTER: It should be defined by statute. If you give the definition by Webster it means the growing of fruits, flowers and vegetables. Ordinarily we mean just the growing of fruit. It should be a broader term.

A MEMBER: I would like to hear from F. W. Dixon.

F. W. DIXON: My opinion is we need not worry about it as long as we have Webster and the Britannica. We usually include flowering plants and trees.

SOME IMPORTANT GARDEN INSECTS.

GEO. A. DEAN, Entomologist, Kansas State Agricultural College.*

Insects injure garden crops in various ways. They feed on the leaves, as does the Colorado potato beetle; tunnel the stems, as the stalk borer; cut off the plants, as the cutworms; devour the roots and the tubers, as the white grubs; and infest the seeds and fruits, as the weevils and the corn-ear worm. The injuries to the succulent parts of plants are not only direct, but entrance is given to decay-producing organisms which may damage the plant or the fruit even more than the insect. Insects also act as carriers of specific plant diseases. Thus the striped cucumber beetle spreads the wilt of cucumbers, squashes, melons and related plants; plant lice carry the cucumber mosaic; the potato flea beetle, the bacterial wilt; the beet leaf hopper transmits the curly-leaf disease of the beet; and the leaf hoppers are responsible for the potato tip burn.

While some garden insects are general feeders, attacking a great variety of plants, the greater number are more or less restricted to a single family or other closely related groups, including both wild and cultivated representatives. Cabbage insects feed on weeds belonging to the mustard family, potato insects on weeds of the solanaceous group, beet insects on members of the pigweed family, and sweet-potato insects on wild morning-glories. The fact that many of the garden insects infest only certain groups of plants is of great practical importance and should be kept in mind in considering methods of preventing injury. It explains the statement, frequently made, that clean farming is one of the most important factors in preventing insect injuries to garden crops. In fact, clean farming, together with the proper cultural methods, will often make it unnecessary to use any special treatment such as spraying, etc.

PLANT LICE.

Garden plants of nearly all kinds, and especially cucumbers, melons, cabbage, tomatoes, radishes and peas, frequently suffer severe injury from the

* Contribution No. 63 from Entomological Laboratory, Kansas State Agricultural College.

attacks of small, soft-bodied, greenish insects known as plant lice or aphids. This group of insects, which feed by sucking the juices of the plants, works on the under side of the leaves. As the sap is extracted the leaves become curled and dry up, frequently causing the death of the entire plant.

With favorable conditions plant lice increase with great rapidity. If they appeared only in small numbers they would not be serious, but when millions of them are at work, covering the entire lower surfaces of the leaves, the plants are soon killed. In the early spring the plant lice suck the juices of various weeds and other plants, but with the growth of melons, cucumbers, cabbage and other garden plants, the winged forms make their way to these plants, seek the under surfaces of the leaves, and here they begin to suck the sap and bear living young. They increase so rapidly that they will do much damage before being noticed unless the grower keeps a very close watch.

Control. Since some of the plant lice pass the winter in the egg stage on the stems of plants, as the cabbage aphid on the cabbage stalk, all remnants of the crop and all weeds growing in and around the garden should be burned in the fall. In the spring weeds and wild grasses should not be allowed to grow around the garden.

The melon aphid, infesting melons and cucumbers, usually first appears on isolated vines throughout the patch. It is very important that the grower should keep a close watch in order to locate and destroy these first colonies, which if located in time usually will be found on just two or three leaves. The infested leaves or the infested portion of the vine should be pulled off and buried.

In most instances, just as soon as the plant lice are discovered the plants should be sprayed with either a nicotine sulphate or a strong soapy spray. The nicotine sulphate should be used at the rate of one-half pint to fifty gallons of water, plus two pounds of common laundry soap. In making a small quantity use one ounce of nicotine sulphate to six gallons of soft water, plus four ounces of soap.

The soapy spray is prepared by dissolving one pound of laundry soap in six gallons of soft water. With either of the sprays it is essential to apply it in such a manner as to actually wet the insect. This can only be done by using a sprayer equipped with a fine nozzle which will furnish sufficient pressure to produce a fine mist. The extension rod on the sprayer should be long enough to reach from one's hand to the ground without necessitating stooping. In spraying vines the lower end of the extension rod should be turned up at an angle of ninety degrees, or equipped with an upturned angle nozzle. With this equipment the spray may be applied thoroughly to the under side of the leaves where the plant lice congregate.

THE HARLEQUIN CABBAGE BUG.

(*Murgantia histrionica* Hahn.)

During the last fifty years the harlequin cabbage bug, also known as the calico bug, fire-back and terrapin bug, has spread from its native home in Central America and Mexico northward into all of the southern states, many of the Atlantic states, and into Kansas, Colorado, Illinois, Indiana, Ohio, California, and Nevada. In the South this species is more injurious than the common cabbage worm, and, indeed, throughout the greater part of its range

applied by means of a powder gun, a perforated tin can, or a cheesecloth bag. The dust should be applied while the leaves are dry.

The arsenicals should be applied as soon as the plants are set and should be kept covered with the poison until the heads are half formed. If this is done the worms will be destroyed before they burrow into the heads, and there will be but little damage after the spraying is stopped. Chemical analysis of sprayed plants has shown that there is practically no danger from eating cabbages that have been treated with arsenicals.

In the case of a few plants, contact insecticides such as pyrethrum, hellebore, buhach, and hot water (150° F.) may be used to kill the worms, or hand picking may be practiced.

STRIPED CUCUMBER BEETLE.

(*Diabrotica vittata* Fab.)

Just as young cucumber and melon plants come up they are attacked by black-and-yellow striped beetles, about two-fifths of an inch long, that have just come from hibernation. The beetles feed so ravenously upon the small, tender stems and leaves that the plants are frequently killed and reseeding is necessary.

The beetles hibernate overwinter in the ground, under trash, or wherever suitable shelter is found, and usually emerge in the spring about two weeks before the cucurbit plants are up. They feed for some time on the pollen of flowers and the leaves of the apple, elm, syringa and many others, but as soon as the cucumber and squash plants appear they congregate and feed on them, often killing them outright, while others are so injured that they make only a sickly growth.

After feeding a few days the beetles mate and the females begin to deposit their eggs. The eggs are about one-fortieth of an inch long and bright yellow in color. They are deposited singly in crevices of the soil or in openings around the stems of the plants. One female lays about 100 eggs during a period of a month, and the eggs hatch in about eight days. The larvæ are slender, white in color, with a dark-brown head, and when full grown are about three-tenths of an inch long. They bore into the roots, often tunneling into the base of the stems, and sometimes feed on the under side of the fruit when it lies on the soil. The larva becomes mature in about one month. It then forms a delicate earthen cell just below the surface of the soil, and in it transforms to a whitish pupa, from which the beetle emerges in from one to two weeks and feeds on flowers and pollen. In Kansas the complete life cycle is from six to seven weeks, and some seasons there are undoubtedly two generations. With the first frosty nights the beetles seek sheltered places and enter hibernation with the first killing frost.

Control. For a few plants, or where the beetles are unusually abundant, coverings of netting or screen wire are used to protect the plants. A barrel hoop cut in two, crossed, and the ends fastened to another hoop for a base, and the whole covered with netting or wire, makes a splendid cover.

Many growers obviate the loss of plants and the necessity of replanting by sowing the seed in rows rather thick, or planting two or three times as many in the hill and then thinning out to the desired distance or to the desired

number after the plants have made considerable growth and the worst injury by the beetle is passed.

Fairly good results may be had by keeping the leaves and stems of the plants thoroughly covered with lead arsenate, applying it as a spray at the rate of three pounds of the paste, or one and one-half pounds of the powdered form, to fifty gallons of water. Probably the lead acts as a repellent fully as much or even more than it does as a stomach poison. Bordeaux added to the lead spray will increase its repellent properties. Since this mixture renders the plants distasteful to the beetles, it is especially valuable for the protection of cucumbers where squashes are used as a trap crop. When it is desired to protect cucumbers, plant squashes around and through the field about a week before planting the cucumbers, and plant more when the regular crop is planted. If the cucumbers, or the main crop, are kept sprayed as recommended above, the beetles will concentrate on the squashes, where they may be destroyed by spraying with kerosene.

Loss from the attack of the beetles may be greatly reduced by thorough cultivation and by proper use of fertilizers which will stimulate rapid growth. In the early fall all rubbish, including old vines, should be collected and burned in order to reduce to a minimum the shelter for the hibernating beetles.

COLORADO POTATO BEETLE.

(*Leptinotarsus decemlineata* Say.)

The Colorado potato beetle is the worst insect pest with which the potato growers have to contend. The original food plant of this insect was the Colorado or watermelon thistle (*Solanum rostratum*). When the early settlers began to plant potatoes in Nebraska and Kansas the beetles soon found in this new plant a food which they liked as well and probably even better than their original food plant. In 1859 the potato beetles were feeding on potato about 100 miles west of Omaha. They spread eastward rapidly, and by 1874 had reached the Atlantic coast. The advance southward was not so rapid, and they did not reach the Gulf states until about 1900. They now occur all over the United States except the Pacific slope. They are also found in Canada from Alberta to Nova Scotia.

The Colorado potato beetle spends the winter in the ground as an adult, emerging in the spring when the plants are very small. The adults feed on the young plants and the females deposit their yellow eggs in masses on the under surface of the leaves. The female will lay, on an average, from 400 to 500 eggs. The egg masses will average about twenty-five, but will vary from four or five to nearly seventy. The eggs hatch in about one week, and the larvæ eat an amount of food out of all proportion to their size. In from two and one-half to three weeks the larvæ become grown, enter the soil to pupate, and in a week or two the adults emerge to lay eggs for the second generation.

Control. If the beetles are attacking potatoes just as they are coming through the ground the adults should be picked off by hand. The plants may later be sprayed with four pounds of arsenate of lead paste, or two pounds of the powdered form, or one pound of Paris green, to fifty gallons of water. In case the Paris green is used, two pounds of freshly slaked lime should be added with every pound of the Paris green. If the potato patch is not large enough to warrant the purchasing of a spraying apparatus, good results may

be obtained by dusting Paris green or powdered arsenate of lead on the plants by means of a perforated tin can. A heaping tablespoonful of Paris green, or two of powdered arsenate of lead, should be mixed with one quart of flour or hydrated lime, and dusted on the plants while the dew is still on them.

GARDEN WEBWORM.

(*Loxostege similalis* Guenee.)

During the summer many kinds of garden plants are injured by greenish-yellow caterpillars about an inch in length, that feed under the protection of a silken web. Although this insect occurs throughout the United States, it is most serious in the central Mississippi states. Several times in Kansas it has proved a serious pest to garden plants, and especially to alfalfa. The larvæ feed normally on the pigweed or careless weed, from which they sometimes receive the local name "careless worm." It is usually only when they become abundant on the weeds that they migrate from them to attack garden crops, alfalfa and corn. They attack a wide range of garden plants, including cabbage, potato, tomato, cucumber, melon, squash, beet, pea, bean, sweet corn, onion and eggplant.

The moth is yellowish, buff or grayish brown in color, with a wing expanse of about three-quarters of an inch. The eggs, which are laid in clusters of from eight to twenty on the surface of leaves of the food plants, soon hatch and the tiny worms begin feeding. In feeding the worms spin a fine web, which gradually envelops the plant, of which nothing is left except the skeletons of the leaves when the worms are abundant. They vary in color from a pale and greenish yellow to a dark yellow, and are marked above with numerous black, shining dots. The caterpillars become full grown in about three weeks, when they descend to the ground and pupate in small silken cells on or just below the surface. The moths emerge in about one week, and thus in midsummer the complete life cycle occupies about one month. In Kansas there are three or four generations a year, the last generation passing the winter as larvæ or pupæ in silken-lined cocoons in the soil.

Control. Since the larvæ usually migrate to the garden plants from near-by weeds, the destruction of the weeds upon which they feed is very important in preventing the undue increase of the pest. The plowing of infested weed fields in late fall or winter will also help very much to control this insect. When the larvæ appear on the garden crops the plants should be sprayed at once with arsenate of lead, using it at the rate of three pounds of the paste, or one and one-half pounds of the powdered form, to fifty gallons of water. The spray should be applied with considerable force in order to break through the webs.

CUTWORMS.

(Noctuidæ.)

Cutworms are among the most troublesome insects with which the gardener and the farmer have to deal. These stout, soft-bodied, smooth cylindrical caterpillars, varying in color from pale or dirty gray to nearly black, sometimes being spotted or striped, are familiar to most persons. They are general feeders, attacking not only garden plants, but also field crops of almost every sort. Their method of attack is to cut off the young plants near the surface of the ground, and since these caterpillars are of large size and voracious

feeders, they are capable of destroying several plants in a single night. Young plants are subjected to injury period from two to four weeks before the cutworms reach maturity and enter the ground to pass into the pupal stage.

Tomatoes, cabbage, sweet potatoes and other plants that are started under glass and transplanted are subject to more serious injury than other plants. Garden crops that grow on sod land or on land that was grown up with grasses and weeds the previous season are most seriously injured. The first few rows of garden plants growing adjacent to alfalfa, clover or grass land are usually badly injured. Some years the cutworms appear in alfalfa and wheat fields in such large numbers as to take on the habits of the army worm, and after destroying the crop in one field will migrate to gardens, and if not brought under control at once will completely destroy all garden plants.

Control. Cutworms are not difficult to control, and while there are several methods by which this may be done, the most effective and the most practical method is to poison them with poisoned bran mash, prepared in the following manner:

Formula for a small amount for use in a small garden:

Bran	1 pound
Paris green or white arsenic.....	1 ounce
Syrup or molasses.....	3 ounces
Lemon or orange (including peel).....	$\frac{1}{4}$
Water	1 $\frac{1}{2}$ pints

Formula for a large amount:

Bran	20 pounds
Paris green or white arsenic.....	1 pound
Syrup or molasses.....	$\frac{1}{2}$ gallon
Lemons or oranges (including peel).....	3
Water	3 $\frac{1}{2}$ gallons

Mix the bran and poison thoroughly in a pan or tub while dry. Mix the syrup or molasses and the finely chopped lemons or oranges in the water. Pour the liquid over the poison bran, stirring thoroughly to wet it evenly.

As soon as cutworms appear sow or scatter the poisoned bran mash thinly along the rows or about the bases of the plants to be protected. In case the plants are growing in beds the bran mash should be sown broadcast over the plants. The application should be made well toward evening or at dusk, since the cutworms feed only at night, or on dull, cloudy days. The bait is always more attractive when fresh. If the cutworms should reappear from adjoining grasslands, repeat the application and sow broadcast a narrow strip of the poisoned bait along the edge of the garden nearest the source of infestation. In order to protect the garden plants along the edge of these grasslands it may be necessary to make two or three applications of the bait at short intervals.

Caution. Receptacles containing the poison bait should not be left around where children, live stock and chickens will have access to it. With proper care there is no danger.

ONION THRIPS.

(Thrips tabaci Lindeman.)

The onion thrips is a small, yellowish insect which punctures the leaves, sucks out the juices and causes the plants to turn whitish, wilt and fall down. This insect is widely distributed not only in the United States, but also Europe, Australia and South Africa. It sometimes seriously infests cabbage and cauliflower, and is found on many other plants. Among them may be mentioned cucumber, melon, squash, tomato, sweet clover, and common garden flowers and weeds. In Europe it is a serious pest on tobacco.

The adult thrips is about one-twentieth of an inch long, pale yellowish color, tinged with black. The wings are long and narrow and bear on the hind margin a fringe of long hairs. When at rest the wings lie together along the back. The wings are of no value for flight.

The onion thrips passes the winter probably in both the adult and immature state on onion and other plants left in the field. It is also probable that it hibernates in rubbish around the edge of the field, and this probably accounts for the infestation usually beginning along the weedy borders and gradually spreading over the entire patch.

The eggs are very small, scarcely visible to the unaided eye. They are laid singly just beneath the surface of the leaf and hatch in from five to ten days. The newly hatched young are only about one-fiftieth of an inch long, almost transparent in color, but resemble the adults in shape. They are frequently found feeding in small groups. In two or three days the young become pale yellow in color, molt several times, and in about twenty-four days complete their growth. There are five or six generations in one season, and breeding continues until cold weather.

Both the adult and young feed on all parts of the leaves, but are to be found in greatest numbers hidden under the sheath at the base of the leaves or between the young leaves and the center of the plant. Plants are most susceptible to injury just at the time they should be making their most rapid growth. The most serious injury is in years of dry weather, because under such conditions the plants are less resistant.

Infested cabbage and cauliflower leaves turn brownish or rusty, instead of whitish as in the case of onions.

Control. Preventive methods, such as clearing away or burning all rubbish and crop remnants, fall plowing, and keeping down all weeds and grasses around the patch, are strongly recommended.

The best remedial results have been obtained by spraying early with nicotine sulphate, using it at the rate of one-half pint to fifty gallons of water, plus two pounds of laundry soap. The spray must be applied in sufficient quantity to wet thoroughly the plants and with sufficient pressure to force the material down into the sheaths of the leaves and between the tender leaves and the center of the plant.

BLISTER BEETLES.

(Meloidæ.)

Blister beetles are ash-gray, black, yellowish or black-and-yellow striped beetles with long legs and elongated bodies that sometimes suddenly appear in gardens and quickly destroy the plants. They are very fond of tomato,

potato and beet. They also attack field crops such as alfalfa and the sugar beet.

Several species of blister beetles are common in central and western Kansas, and sometimes are very destructive to garden plants. Some of these have a sort of migratory habit; that is, they suddenly come in large numbers in a garden, ruin a part or all of the plants in a few days, when they go elsewhere or disappear, and may be seen no more until the following year. However, after the departure of one species a second and even a third may come during the season.

The life history of the blister beetle is not only peculiar but also complicated. The adult female beetle lays a large number of eggs in a small cavity in the ground, and in about ten days there hatch from the eggs small, long-legged larvæ, which run about searching for the pods of grasshopper eggs, upon which they feed. During the summer the larvæ pass through several rather distinct forms, hibernate in the ground during the winter, appear again as larvæ the next spring, pupate later, and transform to adult beetles in the summer.

Control. There is no question but that the larvæ of the blister beetle destroy large numbers of grasshopper eggs and thus aid in keeping these insects under control. However, in many cases the gardener and farmer find that the benefits derived are more than counterbalanced by the losses caused by the beetles, and measures must be used to destroy them.

Inasmuch as blister beetles usually make their attack on garden plants during the latter part of July and through August, and since they usually move in from some adjoining field or appear in some local place in the field, a close watch should be kept, and just as soon as they appear methods of control should be put into operation. Spraying with Paris green or arsenate of lead is one of the best remedies. The infested portion of the garden should be thoroughly sprayed, using from one to two pounds of Paris green, or eight pounds of arsenate of lead paste, or four pounds of the powdered form, to fifty gallons of water. In using Paris green two pounds of stone lime should be used to every pound of Paris green. Since the poisoned beetles are sometimes replaced by others, it is necessary on such occasions to repeat the applications of spray. Inasmuch as the beetles are wild, and when disturbed will drop from the plants to the ground and run rapidly, seeking some sheltered place under which they may crawl, a line of men and children may go into the garden and slowly drive the beetles ahead of them with branches. Before doing this, windrows of hay, straw or other dry vegetable material should be prepared or placed along the side of the garden. When the beetles have run in under or have taken refuge in the windrows, it is fired and the beetles burned. This method has been used with success in the West and Southwest. The important thing in the successful control of blister beetles is to apply whatever remedy is used just as soon as the beetles are discovered.

SQUASH-VINE BORER.

(*Melittia satyriniformis* Hbr.)

In some localities the squash-vine borer is a serious pest of squashes and pumpkins. The insect is widely distributed from Canada south into South America. The larvæ bore in the stems, causing the plants to break off or wilt and die. Usually the first indication that the plant is infested is the

sudden wilting of the leaves, and the presence, of course, of yellowish grains of frass which is found on the ground under the vine. The most severe injury is at the base of the plant, which causes the stems to decay so badly that they break off. Several larvæ may be found in a single stem and as many as forty have been taken in one vine, the larvæ infesting all parts of the vine and even the petioles of the leaves.

The moths appear about the time their food plants start growth. The moth is one of the clear-winged moths and has a wing expanse of about one and one-fourth inches. The fore wings are nearly black with metallic greenish reflection and a fringe of brownish hair. The hind wings are transparent with black scales on the veins and a marginal black fringe. The abdomen is marked with orange or red and black, and the legs are bright orange marked with black and white. The moths fly during the heat of the day and are frequently mistaken for large wasps. The eggs are laid on all parts of the vine, but chiefly on the stems near the base. The eggs are dull red in color and about one twenty-fourth of an inch in length. They are laid singly, but one female may deposit from 100 to 200 eggs. The eggs hatch in from seven to fourteen days, and the young larvæ soon enter the vine and then burrow through the stem, usually toward the root. Later in the season they may be found in all parts of the vine. They are soft, stout, whitish worms with small, black heads, and when full grown are about one inch in length. They reach maturity in about four weeks and then leave the plant, enter the ground to a depth of about two inches, and construct tough, silken cocoons coated with particles of earth. They are about three-fourths of an inch in length. Some of the caterpillars soon transform to pupæ, while others remain in the larval condition until the following season. Those that pupate soon after constructing the cocoon usually transform to moths the same season. In the South there are two broods, but in Kansas there is only a partial second brood.

Control. Since the larvæ work within the vines, they cannot be controlled by spraying with insecticides. In all cases the vines should be raked up and destroyed as soon as the crop is harvested, in order to prevent the late caterpillars from reaching maturity. The land should be plowed in the fall to destroy the overwintering pupæ in the ground. Rotation of the crop will also decrease the number of moths. Where the pest is abundant the main crop may be fairly well protected by planting early squash as a trap crop. These will attract the moths so that only a few eggs, if any, will be laid on the main crop. As soon as the early squashes are harvested, or sooner if they are endangering the main crop, the vines should be pulled up and burned in order to kill the borers within them. It is a good plan to cover the vines with earth one or two feet from the base in order to induce the growth of secondary roots, which will support the plant in case the main stem is injured.

After the borer has once entered the vine the old-fashioned method of slitting the vines with a knife and killing the borers is about the only means of reaching them.

SQUASH BUG.

(*Anasa tristis* De Geer.)

The squash bug is widely distributed throughout the United States and in many localities squash and pumpkin plants are seriously injured. Cucumbers and melons also may be attacked.

The adult bug has a dirty, brownish-black color above, and brown mottled with black below. It is about three-fourths of an inch in length and has a highly offensive odor.

The adult bugs pass the winter in rubbish, in piles of wood or boards or under any shelter. They emerge from hibernation rather late in the spring and attack the squash plants as soon as they are up, and frequently kill them outright. In feeding the insect punctures the plant with its beak and extracts the juices. When the plants are small they apparently are injured more by some poison that is injected into the plant tissue than from the loss of sap that is extracted.

The females deposit their eggs in clusters of from four to fifty on the under side of leaves. Egg-laying covers a period of from six to eight weeks. The eggs at first are a pale brown, but they soon become dark. They hatch in from seven to fifteen days, depending on the temperature. The young bugs are brightly colored. The body is bright green; the legs, antennæ and beak crimson; and the head and front part of the thorax a rose color; but in a few days the crimson changes to a pit black. The young bugs remain together, sucking the juices from the leaves and causing them to wither and die. The bugs reach maturity in from four to five weeks, during which period they molt five times. When not feeding, the older nymphs and also the adults congregate around the base of plants and under lumps of earth. In southern Kansas the squash bug has, besides the first summer generation, a large, not incomplete second generation, and a small third generation. In eastern Kansas there is probably a small second generation.

Control. The adult bugs are very resistant to contact sprays, and thus other methods must be used. Culture methods, such as crop rotation, thorough tillage and clean farming in the fall, will greatly decrease the number of bugs appearing in the spring. Hand picking of the eggs and the clusters of young bugs from the plants early in the season is practical in small gardens. The adult bugs may be trapped by placing small pieces of boards near the vines, under which the bugs will hide at night, and from which they may be collected in the early morning.

When the bugs are young they may be killed by spraying with nicotine sulphate, using it at the rate of one point to fifty gallons of water, plus two pounds of soap. Fish-oil soap at the rate of one pound to four gallons of water is also an efficient spray. In spraying, an upturned or angled nozzle should be used in order to reach the bugs on the under leaves.

GRASSHOPPERS.

(Acrididæ.)

In localities where grasshoppers are common nearly all garden crops are subject to injury by a few species of grasshoppers, the two most injurious of which are the differential and the two-lined grasshopper. These two grasshoppers are similar in size and color. The differential has a yellow body with black markings on the sides of the neck and the sides of the abdomen. The two-lined grasshopper has a brownish-yellow body, with a yellow stripe extending from each eye back across the neck onto the wings.

Injury to garden crops by grasshoppers is nearly always from invasion by hoppers that breed in surrounding land, and control measures must be directed

toward destroying them in their breeding places as well as to preventing invasion. Gardens that lie in the range of barnyard fowls and are fenced are usually kept free from grasshoppers through the work of the fowls. In other cases the garden may be so located that measures used to protect other crops will also protect the garden crops. Where not protected as above mentioned or by some other factors garden crops are likely to be the first to suffer injury from grasshoppers. They should be protected not only by persistent applications of poisoned bran mash, but a determined effort also should be made to free the surrounding fields from the hoppers. The poisoned bran mash should be prepared according to the formula recommended for cutworms, on a previous page, and as soon as the grasshoppers enter the garden the bran mash should be sown broadcast over the plants early in the morning, or about the time the hoppers begin to move about. It should be scattered sparingly in such a manner as to cover about one-fifth of an acre with the amount of bait made by using one pound of bran. Since very little of the bran mash is eaten after it becomes dry, scattering it broadcast in the morning places it where the largest number will find it in the shortest time. Sowing it in this manner also makes it almost impossible for birds and barnyard fowls to secure a sufficient amount of the poison to kill them. Since the grasshoppers will keep coming into the garden from adjoining fields, it will be necessary to either destroy them in these surrounding fields or make several applications of the poison over the garden plants.

To make a successful fight against grasshoppers too much emphasis cannot be laid upon the necessity of beginning promptly as soon as the insects are present in sufficient numbers to threaten the crops and continuing vigorously as long as the grasshoppers are present.

FLEA BEETLES.

(Chrysomelidæ.)

Frequently flea beetles become very troublesome on garden crops. They are small, dark-colored leaf beetles, with the hind legs enlarged for jumping. When disturbed they spring suddenly into the air and escape. They usually eat out little holes or pits in the leaves. Those that are badly injured or riddled with holes turn brown and die. The most serious injury occurs in the spring by the beetle that passed the winter in rubbish, under leaves, and in dry, sheltered places. It frequently happens that the injury to garden crops takes place first along the edge of a field that has furnished shelter for the hibernating beetles. In some cases the larvæ feed in the roots of the plants attacked by the beetles, but probably in most instances the larvæ attack roots of weeds and grasses growing around the garden. Some species of the beetles feed on just one or two food plants, while others attack a large variety of plants, even in widely separated families. However, most species prefer certain groups. For instance, one prefers the cabbage, turnip, radish and mustard family, another attacks the potato and tomato, while another is restricted to the beet and other plants of the same family.

Control. Clean culture and the burning of the winter quarters of the beetles are important preventive methods.

The most effective spray is Bordeaux mixture combined with arsenate of lead paste at the rate of four pounds, or the powdered form at the rate of two

pounds to fifty gallons of water. The Bordeaux combined with the lead makes a good deterrent, and probably the arsenate of lead acts as a repellent fully as much as a stomach poison. It is very essential to apply the spray in such a manner as to cover the surface of all the leaves, for if not applied thoroughly the beetles will avoid the poison and attack the leaves where the spray has not been applied.

THE COMMON STALK BORER.

(*Papaipema nitela* Guenée.)

The stalk borer is widely distributed throughout the United States east of the Rocky Mountains. While it is usually present in small numbers, there are times, particularly a summer following a wet year, when serious outbreaks occur, which may extend over a large portion of a state. The insect has a wide range of food plants, including vegetable crops, such as potato, tomato, cauliflower, sweet corn, eggplant, bean; cultivated flowers, such as dahlia, aster, lily, hollyhock, golden glow, peony, castor bean; staple crops, such as wheat, oats, rye, barley, corn, timothy; and weeds, such as ragweed, pigweed, cocklebur, burdock, etc. The tender shoots of the raspberry, blackberry, currant and gooseberry may also be attacked.

The moth, which is fawn-gray or mouse color, lays her eggs in the fall on the stems of ragweeds, pigweeds, dock, smartweed, foxtail, crab grass, and other weeds and grasses. The eggs are in masses of about fifty and are usually near the ground. The eggs hatch during the latter part of May and the early part of June. The young caterpillars may feed for awhile by mining the leaves, but in a few days they work down to the bases of the leaves and enter the stalks, which they tunnel out, and frequently will leave one plant, migrate a considerable distance and enter another. The infected plant can usually be recognized by the wilting parts above the larva. The larvæ become full grown about the first week in August, at which time they are about one and one-fourth inches in length. The larva is from purplish to whitish brown in color and is marked with five white stripes along the middle of the back and two on each side. These stripes are absent on the first four segments of the abdomen, which gives the larva an appearance of having been pinched or bruised. The larvæ pupate in the burrow, usually in the lower part of the stalk. In about three weeks the moths emerge, and during September and early October the females deposit their eggs on the stalks of their food plants.

Control. There is no practical method of reaching the borers in their burrows. From the life history it is obvious that clean farming, fall plowing and the destroying of all rank weeds near the garden should prevent any general injury. In the case of a few plants, or in a small garden, the prompt destruction of infested plants will prevent the borers from migrating to others. Where weeds are infested near a garden they should be burned or hauled away as soon as cut, for if left on the ground the larvæ will soon migrate from them to the nearest plants.

POTATO-STALK WEEVIL.

(Trichobaris trinotata Say.)

With the exception of the southern states, the potato-stalk weevil or borer is distributed throughout the greater part of the United States. Probably the most serious injury has been in Kansas, Nebraska and Iowa. Its wild food plants include a number of the nightshade family, or Solonaceæ, such as the ground cherry, Jamestown weed and Colorado thistle.

The adult is a snout beetle about one-fourth of an inch in length, bluish-gray in color, with a black head or snout, and is marked at the base of the wing covers by three black spots. The beetles that have passed the winter in the old potato vines or wild food plants appear in the field in the spring and feed for a time on the stems of the potato plants, which they puncture. The female punctures a small hole in the stalk or branches, and sometimes in the leaf petioles, hollows out a small cavity, and there lays a single, oval, whitish egg. In from seven to eleven days the egg hatches, and the white, brown-headed, footless, grublike larva commences to bore into the stalk. The grub will burrow down through the stalk several inches and then turn about and retrace its course. The presence of the larvæ is indicated by a wilting and drying of the leaves, although the stems remain green for some time. Several grubs may infest the same stalk and kill the entire plant. The larvæ reach maturity about the middle of July and then construct cells or cocoons in the burrows, in which they transform to white pupæ. They remain in the pupal stage about two weeks and then transform to adults, but the beetles do not emerge until the following spring, unless the stalks are broken open and they are forced to seek winter quarters. There is but one generation annually.

Control. An effective method of control is to rake up the vines and burn them as soon as the crop is dug. If this method, together with clean farming, or the keeping down of solanaceous weeds is practiced, injury from this insect can be prevented almost entirely.

FALSE CHINCH BUG.

(Nysius ericæ Schilling.)

The false chinch bug is widely distributed throughout the United States, and in Kansas cabbage, turnip, radish, beet, cauliflower and lettuce are occasionally subject to injury.

This insect hibernates as an adult in rubbish, under leaves and around the bases of plants. The adult is about one-eighth of an inch in length, grayish brown in color, sprinkled with black. The bugs may injure garden plants in early spring at the time the adults emerge from hibernation, or from the middle of summer to early fall, when, deprived by drought and adverse growing conditions of their food plants, they migrate from surrounding fields to the gardens. In feeding they puncture the leaves, suck out the juices, causing the plants to wither, turn brown and die. In Kansas there are probably four or five generations annually. The early spring brood deposit their eggs in cracks in the soil, while the other broods place theirs in the heads of various wild plants. The young bugs are fond of peppergrass, shepherd's purse, sagebrush and Russian thistle.

Control. Clearing the fields of rubbish in the fall and early winter, burning their hibernating quarters, such as grasses, weeds and leaves around the garden and in waste places, will furnish the best protection from injury by the false chinch bug. If the insects have attacked the garden plants they may be killed by thorough spraying with nicotine sulphate used at the rate of one-half pint to fifty gallons of water, plus two pounds of common laundry soap.

DISCUSSION.

W. A. S. BIRD: Professor, in scattering that bran mash, isn't there danger of killing the little birds?

PROFESSOR DEAN: No, sir. Our method of using that has been thoroughly investigated. An investigation was made at the time of the grasshopper outbreak, by Professor Dyche, our former fish and game warden.

JAMES SHARPE: How about the leaf hopper?

PROFESSOR DEAN: It hibernates during the winter in rubbish, leaves and grasses, and emerges with the coming of warm weather. You must get them while they are yet small. You cannot do anything with the adults; they are too wild and shy. If they are already in the jumping stage you might as well not spray; it will not hit them.

JAMES SHARPE: Some years they are worse than others.

PROFESSOR DEAN: It depends somewhat on climatic conditions. If the winter is favorable they get through very well, but if wet and snowy it is adverse to them. Mr. Yaggy has had a great deal of trouble with them at Hutchinson. The apples are injured by them too. Many of the trees had the leaves badly discolored, and whenever the leaves of the tree are injured and not permitted to function as they should you are not getting strength into that tree that you should have for the coming year.

PRESIDENT HOLSINGER: I notice that you say the trash should be burned. Would it do to have the ground fall plowed and have that trash raked in the furrow and covered?

PROFESSOR DEAN: Yes, sir. There is no question that wherever one can cover trash, that should be done rather than burning. Burning should not be advocated except where you have a place where plowing is not practicable. In the average garden many people have left old tomato vines and cabbage stalks and do not try to plow them under.

PRESIDENT HOLSINGER: How about bagworms? Would it be sufficient to pull them off and throw them on the ground, or should they be burned?

PROFESSOR DEAN: Gather those bags and destroy them, either in the early fall or early spring, and you have gotten the insect before it emerges.

PRESIDENT HOLSINGER: Would the young be active enough to get out and climb the trees?

PROFESSOR DEAN: Yes, sir; they would. They would pull the bag right along with them.

JAMES SHARPE: How early does the leaf hopper come out in the spring?

PROFESSOR DEAN: The leaf hopper comes out fairly early in the spring.

JAMES SHARPE: Could you use black leaf 40 as a spray?

PROFESSOR DEAN: Yes, sir; that is, if you use it as a killing spray on the first brood. The easy way to determine that is to look at those leaves four or

five weeks after the tree has been in bloom, and then you will see those little immature ones, and that is the time to get them; that is your first generation. You may find it necessary to spray at a time when you cannot spray for codling moth, but usually black leaf 40 spray can be used with codling moth spray.

JAMES SHARPE: Can you use black leaf 40 with the blotch spray? I use that spray about two weeks after petals fall.

PROFESSOR DEAN: If you found any live hoppers there you could use it. That would be your first generation.

GEO. W. KINKEAD: You mentioned use of soap with black leaf 40. Would you use black leaf 40 without soap?

PROFESSOR DEAN: No, sir; never without soap. We have tried to impress that upon everyone using black leaf 40.

SOME INSECTS INJURIOUS TO ORNAMENTALS.

GEO. A. DEAN, Entomologist, Kansas State Agricultural College.*

The presence or absence of ornamental shrubs are important factors in determining the value of residential property. Properties in towns and cities in which shrubs are either lacking or in poor condition offer little attraction to a person seeking a home in comparison to properties having well-kept shrubs.

Fortunately, the number of species of insect foes harmful to ornamental shrubs is not large in comparison to the numbers infesting the shade trees, and since they are so much more accessible, it is not nearly so difficult to control them. In fact, little excuse can be given for permitting insects to seriously injure shrubs.

LEAF-FEEDING INSECTS.

The most important insects feeding on the leaves are the caterpillars of moths, the larvæ of sawflies, the adults of leaf-eating beetles, and grasshoppers. Some of these insects are omnivorous, feeding on many species of shrubs, while others feed on certain shrubs. Usually the injury is so characteristic that the insect may be distinguished by the nature of the work. The injury may be small, circular holes eaten through the leaf, as is frequently done by adult beetles or small caterpillars; the holes may be large, ragged ones, as the work of May beetles and grasshoppers; the softer parts of the leaf may be eaten away, leaving the veins and upper epidermis, as the work of the rose slugs. The leaf may be all eaten except the main veins, as is done by the cankerworm on the rose; or the inner tissue of the leaf may be eaten, leaving both the upper and lower surfaces, as the work of the leaf miners.

The principal leaf-feeding insects, except the leaf miners, may be effectively controlled by spraying with lead arsenate, in such a manner as to cover the surfaces of the leaves with the poison, which is taken into the stomach of the insect when it feeds on the leaves.

* Contribution No. 75 from the Entomological Laboratory, Kansas State Agricultural College.

Three species of slugs, which are roses in this country seriously injured unsightly.

American rose slugs. This species is found in the United States and Canada. It is green, long, larger at the head end, and resembles a caterpillar. It is frequently called a false caterpillar. It has a slimy mark on the leaf, as in the case of the winter as a pupa in the ground. In the summer the leaves become partly developed, the eggs on the leaves. They hatch in the night on the upper surface of the leaf. They may be found hiding on the under surface of the leaf. They will feed during the day. In the morning they feed on the parenchyma, leaving the veins and the veins have the appearance of having been eaten. In about ten days and crawling a month another generation appears.

The bristly rose slug. This species is the most common of the county it is the most common of the larva when full grown is about two-thirds in color, with a dark green line down which give it a bristly appearance. the leaf. When nearly full grown, the stronger ribs.

The curled rose slug. This rose slug is found in many parts of the United States. The sides and legs grayish white. The back is brown, marked with a broad, black band. The leaves, eating out large sections, the body of the larva is curled.

Methods of control. The rose slug is controlled by dusting with lead arsenate at the usual rate, or by dusting the leaves with white hellebore in the proportion of two ounces of hellebore to one gallon of water.

JUNE BUGS

June bugs or May beetles are widespread pests, feeding on the leaves of shrubs. Their larvae, known as white grubs, are serious pests of lawns, crops and field crops.

Life history. There are many species very similar in color, form and size. about three-fourths of an inch in length. bump against the screens. The grub and lie curled up in a semicircle. They deposit their eggs in the ground, pre-

and gardens. The grubs hatching from these eggs live in the soil from one to three years, feeding on the roots of plants, which they frequently destroy. Many of the species are three years in their life cycle. In the fall the grubs burrow in the soil below the freezing line. The following spring they come near the surface again and feed on the roots. In the summer they pupate, usually four or five inches below the level of the soil. The pupæ transform to beetles a little later, but usually the beetles remain in the earthen pupal cells until the next May or June, at which time they emerge and feed on the leaves of shrubs and trees and the buds and petals of flowers. It is not uncommon for them to defoliate shrubs and ruin unfolding flower buds.

Control. Just as soon as the leaf injury is noticed the shrubs should be sprayed with lead arsenate at the rate of three pounds of the paste, or one and one-half pounds of the powdered form, to fifty gallons of water; in a small way, one ounce of powdered arsenate of lead to two gallons of water.

ROSE CHAFER OR ROSE BUG.

This insect is widely distributed in the United States from Colorado east. It also occurs in Canada. It is a serious pest of the rose and grape, and does considerable injury to shrubs, and even garden fruits and vegetables, eating blossoms, leaves and the fruit.

Life history. The beetles are about one-third of an inch long and golden brown in color. The legs are long, pale red in color and armed with strong spurs. The beetles appear in the spring and feed for about a month on the foliage and blossoms of many plants, particularly roses. The injury by this insect is due almost entirely to the work of the adults. The beetles deposit their eggs in the ground near the surface. The eggs hatch in two or three weeks, and the grubs, resembling somewhat those of June bugs, feed on the roots of various plants. They winter deep in the soil and complete their growth in the spring.

Control. The arsenical poisons will kill the adults, but they are so slow in their action that the beetles seriously injure the plants and unfolding flower buds before they are killed. Arsenate of lead, at the rate of five pounds of the paste to fifty gallons of water, combined with Bordeaux, if applied very thoroughly as soon as the beetles appear, has given fair results. In some districts the beetles are collected with mechanical devices. In case of roses and low-growing shrubs, hand picking, though tedious, is practical.

THE BAGWORM.

For several years the bagworms have been a common pest on shrubs and trees in southeastern and south central parts of the state. They are particularly fond of the arbor vitæ and red cedar and frequently ruin hedges of these plants.

Life history. The bagworms construct grayish or brownish bags of silk, covered with bits of leaves. The bags are pointed at both ends, and in the males are about an inch and a quarter in length, while in the females they are about two inches. The greatest diameter is about a half inch. They are found on the trees and shrubs in summertime in young stages, but more noticeable in the fall and winter when the trees are without leaves.

The bags of the females are filled with eggs, which live through the winter

and begin to hatch in May. The young larvæ begin feeding on foliage, and construct for themselves bags, which they enlarge as they grow. The bags are carried about in summer by the dark-colored larvæ, which protrude the head and fore legs and pull themselves along. When full grown they attach their bags to the twigs and pupate within them. Late in the summer the males emerge and fertilize the females, which remain partly inside the bags. The females lay their eggs in the bags, then perish. The eggs remain in the bags until the following spring, as described. The male moth itself is an insignificant object, less than an inch long, of dull blackish color and with transparent wings and short, stout body.

Control. This insect may be controlled by spraying with lead arsenate at the rate of three pounds to fifty gallons of water. The spray should be applied when the worms first appear. During the winter the bags may be picked off shrubs, arbor vitæ and cedar hedges by hand.

GRASSHOPPERS.

In years when grasshoppers are abundant and the food supply is giving out, they will frequently migrate into the yards and attack shrubs and trees. If methods of control are not practiced they may defoliate and seriously injure the shrubs in a very short time. The best method of control is to use poisoned bran mash prepared in the following manner:

Formula for a small amount for use in a small garden:

Bran	1 pound
Paris green or white arsenic	1 ounce
Syrup or molasses	3 ounces
Lemon or orange (including peel)	$\frac{1}{2}$
Water	1 $\frac{1}{2}$ pints

Formula for a large amount:

Bran	20 pounds
Paris green or white arsenic	1 pound
Syrup or molasses	$\frac{1}{2}$ gallon
Lemon or oranges (including peel)	3.
Water	3 $\frac{1}{2}$ gallons

In preparing the bran mash, mix the bran, white arsenic or Paris green thoroughly in a pan or washtub while dry. Squeeze the juice of the oranges or lemons into the water, chop the remaining pulp and the peel to fine bits or run them through a meat grinder, and add them to the water. Dissolve the syrup in the water and wet the bran and poison with the mixture, stirring at the same time so as to dampen the mash thoroughly.

The grasshoppers should be poisoned before they enter the yards to attack the shrubs. This can be done by keeping a close watch, and as soon as the grasshoppers are beginning to move into the yard a strip of the bran mash should be sown broadcast along the edge of the yard nearest the source of infestation. The bran mash should be sown early in the morning, or about the time the grasshoppers begin to move about. In order to protect the shrubs it may be necessary to make two or three applications of the bait at short intervals. If they have already attacked the shrubs the poisoned bait should be scattered sparingly over the shrubs and underneath them.

The shrubs may also be protected by spraying with lead arsenate at the rate of four pounds of the paste, or two pounds of the powdered form, to fifty gallons of water.

THE SCALE INSECTS.

Perhaps no other single group of insects attacking ornamentals is of more economic importance than the scale insects. They not only seriously injure many of the shrubs, but also kill many of them. They do not resemble other insects. They are flattened, circular or oval in shape, and vary in color from white to reddish brown or black. Soon after hatching, or birth, the young usually attach themselves to the plant, and never move from this feeding position. Beneath the scalelike covering the body is degenerate, lacking organs of special sense and locomotion. The females are always wingless, but the mature males have wings, legs and antennæ. Some species of scale insects reproduce with remarkable rapidity and in a year or two may occur in such enormous numbers as to completely encrust the shrub. This is frequently true of the San José scale.

THE SAN JOSÉ SCALE.

The San José scale, a serious pest of fruit trees and ornamental shrubs, is an imported pest which was first noticed near San José, Cal., about 1880. This insect is now generally distributed over the United States.

Life history. The San José scale is a flat, circular, scalelike object, bearing at its center a little point surrounded by a circular groove. It lies flat upon the bark, and ranges from a tiny point to the size of an ordinary pinhead, depending on the degree of development. Beneath the protective scalelike covering is a lemon-yellow, soft-bodied object—the real insect. It passes the winter in a dormant state as a three-fourths-grown insect, lying flat on the bark. With the flow of sap in the spring it begins to suck the sap from the tree or shrub and continues to grow. About the first of June it is fully grown, and then it begins to give birth to living young, and continues this at the rate of nine or ten a day for a period of six weeks. The young scales reach maturity and begin to bear living young in about one month from the date of their birth. There are four generations of the San José scale in one season, and it has been estimated that the progeny of a single female, if none were destroyed, would amount to about 3,216,000,000 individuals in a single year.

San José scale may attack many kinds of trees, shrubs and vines, but is primarily a pest of fruit trees and shrubs. These trees and shrubs cannot be grown successfully where the scale has secured a foothold if no effective efforts are made to control it.

Of the fruit trees, the peach, Duchess pear and Blue Damson plum are most liable to serious infestation, and the most favorable food plants of the shrubs are probably the japonica and the Osage orange hedge. But it also attacks the lilac, snowball, some species of roses, and others.

Control. That San José scale can be controlled has been thoroughly demonstrated in all parts of the country. Some of the general steps in this process are: first, to cut and burn all hopelessly infested plants; second, to prune carefully all plants that can be saved, and burn the prunings; third, during the dormant condition to spray the trees and shrubs thoroughly with lime sulphur; fourth, to continue this treatment year after year so long as any trace of the scale can be detected.

THE ROSE SCALE.

The rose scales are flattened, pure-white scales, which are so thick on roses and raspberry as to give them a gray or whitish appearance. The scale is widely distributed.

Life history. The life history of this species is not different in any important respect from the other scale insects.

Control. For the control of this insect it is usually sufficient to prune out the badly infested wood, and sometimes it is well to apply a dormant spray of lime sulphur to what remains, but this is not usually necessary.

THE OYSTER-SHELL SCALE.

This scale is dark brown in color, nearly an eighth of an inch long, irregularly curved, and flaring at one end, the shape suggesting an oyster shell. It is widely distributed and attacks apple and pear trees, lilac, red-twig dogwood, blackberry and raspberry. The lilacs are frequently seriously injured by this scale.

Life history. The winter is passed in the egg stage, the eggs being deposited by the female in the fall under the scale, the female herself dying and drying up, so that all that may be found under the scale during the winter months is the large number of white, oval eggs. These hatch in the spring, and the young scales crawl out and develop. The females produce eggs about mid-summer and die, a second brood being formed which furnishes the overwintering eggs.

Control. Spraying with lime sulphur or with miscible oil during the dormant period is the most satisfactory control method. Standard liquid lime-sulphur should be used at the rate of one part to seven parts of water; the miscible oil at the rate of one part to twelve parts of water.

THE COTTONY MAPLE SCALE.

The cottony maple scale is very noticeable on the limb, because of the large, white, waxy ovisac. It is common on the maple and box elder, but may also be found on several shrubs and vines, such as the japonica, sumac, rose, lilac, hawthorn, Virginia creeper and grapevine.

Life history. The scale passes the winter as a small, flat, brown object attached to the limb. During May and June the cottony masses are secreted, and within them each female may deposit from 2,000 to 5,000 reddish-yellow eggs. The eggs hatch in June and early July, and the young establish themselves upon the under side of the leaves, usually along the midrib. Before the foliage drops the females crawl to the twigs and attach themselves for the winter.

Control. Most satisfactory control is obtained by spraying with miscible oil, one part to twenty-five parts of water, in the spring before the buds open. This treatment kills the overwintering females.

OTHER FORMS OF INJURIOUS INSECTS.

PLANT LICE.

Plant lice are soft-bodied, pear-shaped, usually green-colored, winged or wingless insects, which are usually gregarious. The legs are long and slender and the mouthparts are adapted for sucking the sap from the plants.

There are many species of plant lice attacking shrubs and garden flowers. Some feed entirely on the leaves, frequently causing them to curl or become gall-like; others infest the roots, producing nodular swellings or galls, while others cause galls on the twigs, leaf petioles and the leaves. Some of the plant lice secrete a wooly, waxen substance that protects them, while others secrete a sweet, watery substance known as honeydew. This honeydew, which may completely cover the leaves, offers a good culture medium for black fungi that frequently prove fatal to the leaves. One of the most common species of plant lice attacking shrubs is the rose aphid, which appears early in the spring and multiplies very rapidly.

Life history. While considerable variation occurs in the life history of plant lice, they generally pass the winter in the form of eggs, which are deposited in the fall by the fertilized females. The eggs are usually laid in the crevices of the bark, in leaf scars, around new buds, and on the stems and roots of weeds and grasses. In the spring the eggs hatch into the wingless agamic females, which without fertilization give birth to living young. In a few days these develop into wingless females that reproduce without fertilization. Three or four successive generations occur in this manner, and then occurs a generation of which all or part of the individuals are winged. The winged forms fly to other trees or plants, and there without fertilization start new colonies. In the fall a brood of winged males and wingless females appears. They mate, and the females lay one or two large eggs, in which condition the winter is passed.

With favorable conditions plant lice increase with great rapidity. If they appeared only in small numbers they would not be serious, but when millions of them are at work, covering the entire plants, the plants are soon killed.

Control. In most instances, just as soon as the plant lice are discovered the shrubs and garden flowers should be sprayed with either nicotine sulphate or a strong soapy solution. The nicotine sulphate should be used at the rate of one-half pint to fifty gallons of water, plus two pounds of common laundry soap. The soapy spray is prepared by dissolving one pound of laundry soap in six gallons of water. With either of the sprays it is essential to apply it in such a manner as actually to wet the insect. This can only be done by using a sprayer equipped with a fine nozzle which will furnish sufficient pressure to produce a fine mist.

MEALY BUGS.

Mealy bugs are oval, soft-bodied bugs, about one-eighth of an inch long, and have the body covered with a whitish, mealy, powdery secretion. In the temperate regions they are found for the most part on house plants and plants growing in greenhouses. They are frequently very bad on coleus growing in porch and window flower boxes.

Control. In greenhouses the best method of control is fumigation with hydrocyanic acid gas. Contact insecticides and washes are also used. A spray must be applied with considerable force in order to penetrate the protective cover of the insects. Dusting with fine tobacco dust has given fair results. In the case of house plants it is practical to wash them with nicotine sulphate or a strong, soapy wash. The nicotine sulphate wash is prepared by mixing one-half ounce of nicotine sulphate and four ounces of common laundry soap

in six gallons of water. The soapy wash is prepared by dissolving one pound of common laundry soap in six gallons of soft water. The washing should be done with a soft cloth.

If house plants are not too large they are dipped in warm water. The water should be from 125° to 130° F., and the plants held under the water for about ten seconds.

RED SPIDER.

The red spider, which is a small mite, is very widely distributed. However, it usually occurs most abundantly in regions where the climate is dry or is most troublesome in seasons of drought. It attacks a great variety of plants both in the open and the greenhouse. Roses, arbor vitæ, juniper, lilac and snowball are frequently infested. In greenhouses, roses, chrysanthemums, carnations and violets are often injured.

Life history. The full-grown female red spider is not more than one-fiftieth of an inch in length. The male is even smaller, measuring only about one seventy-fifth of an inch. The mite varies greatly in color from greenish to orange or reddish, or it may be brown. In feeding the mites pierce the leaf tissues from the under side and suck the juices. Badly infested plants are covered with a network of fine webs, which not only aid in concealing the mites, but also enable them to run about more quickly. Infested leaves usually take on a mottled appearance, and if the mites are numerous the entire leaf dries up and dies. Under outdoor conditions the winter is passed in the egg stage, the young mites appearing in the spring when the foliage is well developed. There are several generations annually, and each female lays from 50 to 100 eggs. In greenhouses breeding or development may be continuous throughout the year.

Control. In greenhouses and with house plants the mites may be checked by watering the plants frequently with a nozzle that produces a spray with considerable force. However, the plants should not be drenched.

One of the best and most practical methods of controlling mites when infesting shrubs is to wash them off with water from the hose, sprayed on with sufficient pressure to dislodge and destroy them.

Spraying with either nicotine sulphate or a strong soapy spray will give fair results. The nicotine sulphate is used at the rate of one-half pint to fifty gallons of water, plus two pounds of laundry soap. The soapy spray is prepared by dissolving eight pounds of laundry soap in fifty gallons of soft water. The sprays should be applied with considerable pressure.

The mites may also be held in check by dusting the plants with finely ground sulphur.

ROSE-LEAF HOPPER.

(*Empoa rosæ.*)

The rose-leaf hopper, an European insect, is now very common all over the United States and Canada. It is a general feeder and will attack many shrubs, trees, and even vines, but appears to prefer the rose and apple, or at least these are frequently injured.

Life history. The adult is about one-twelfth of an inch long and is creamy white to light yellow in color. The eggs are laid in the fall in the bark of the

rosebushes, apple trees, berry canes and other shrubs and plants. However, most of the eggs are probably deposited in the rose stems. They hatch in the spring and the young leaf hoppers, or nymphs, suck the sap from the under side of the leaves, producing a mottled appearance at first, but as the injury increases the leaves turn a whitish yellow and dry up. The leaves do not curl as in the case of the apple-leaf hopper. There are two generations of this insect in a year, the second generation appearing in midsummer.

Control. The best method of control is to spray the bushes with nicotine sulphate as soon as the young leaf hoppers appear. If the spraying is delayed until the hoppers are nearly full grown the results will not be nearly so good, due to the fact that the leaf hoppers are now wild and jump away just ahead of where the spray is striking the plant. The spray to be effective must actually strike and wet the insect.

OTHER LEAF HOPPERS.

Many other leaf hoppers are at times serious pests on shrubs and vines, particularly vines. Some of these, like the apple-leaf hopper, will cause the leaves to curl, especially those near the tips of new shoots. Other leaf hoppers will cause the leaves to become mottled and later turn a whitish yellow, similar to those attacked by the rose-leaf hopper. The apple-leaf hopper and some others winter as adults under leaves and other rubbish, and in the spring they come from their winter quarters and lay their eggs in the veins of the leaves. There may be as many as three generations of some species in a season.

Control. In addition to the spraying recommended for the rose hopper, the raking and burning of leaves and rubbish from under the bushes and about the yard will help in destroying the wintering adults.

AN OUNCE OF PREVENTION.

S. J. HUNTER, Entomologist, University of Kansas.

Many years before economic entomology became a science the ship builders of Sweden consulted Linnæus regarding the means for preventing losses due to borers in ship timbers. The famous naturalist, knowing the life history of the borer, advised the shipbuilders to submerge their timbers in the sea during the month of May, the egg-laying period of the borer, thus preventing the laying of eggs on the timbers and subsequent financial losses.

It used to be taken for granted, as many of those present recall, that measles, mumps, chickenpox and the like were stages through which every child had to pass, and the earlier they were taken the easier they would be to endure. Hence little precaution was taken to avoid them. Now preventive medicine is coming to be one of the prominent departments in our medical schools. It is well recognized that all such diseases deplete if not seriously impair health, and so it is with the horticultural interests.

Plants, trees and shrubs, like human beings, have limited vitality. The cankerworm may defoliate the elm and the apple, and the tree may recover. It has been abundantly demonstrated, however, that a few such defoliations result in the death of the tree. It has, therefore, seemed profitable to discuss

the subject of injurious insects from the standpoint of prevention rather than from the standpoint of treatment after the insects have commenced or completed their ravages.

Based on estimates of recent years, the annual loss to the deciduous fruit industry on this country through the ravages of insects is from 75 to 100 million dollars annually. Some estimates are placed higher, but none lower.

This sum includes the cost of spraying and other measures of control. The greatest estimated loss is charged against the codling moth. This in part is due to the extent of ravages of the insect and in part to the magnitude of the industry affected.

CODLING MOTH.

(*Carpocapsa pomonella* Linnaeus.)

This insect spends the winter as a larva. Cellars, apple-storage houses and packing sheds should therefore be screened to prevent the escape of the moths in the spring. The greatest prevention, however, lies in the proper application, both as to time and manner, of the first spray. The great majority of the young worms enter the apple at the blossom end. For about ten days, depending on the weather, after the petals fall, the calyx lobe is spread wide apart and the young apple stands upright on the stem with the calyx end directly upward. If during this time arsenical spray is applied thoroughly and with sufficient force to drive the poison into the calyx cup, the minute particles of the poison will be deposited where the young worm will get it in its first meal after it enters the fruit. This being the case, it will be its last meal. In less than two weeks the calyx lobes close, and then it is too late to spray effectively. This is strictly a preventive spray, and it is still a question whether subsequent sprays return a profit. In one of our series of experiments an important part of the pump broke and delayed us a week just at this critical period. The part of the orchard subsequently sprayed showed fully as high percentage of codling-moth damage as did the check row left unsprayed.

SPRING CANKERWORM.

(*Paleacrita vernata* Peck.)

Prevention in this case lies in the wingless condition of the female. This insect transforms during the winter, generally in the ground, and the wingless females ascend any upright object to deposit their eggs. If the object happens to be one of its food plants, such as the apple or elm, the young caterpillars begin to feed on the buds even before they have begun to open. These insects begin to emerge with the first warm days of spring, usually about the first of February. Should there be a warm period in January they are likely to appear then, as our observations have frequently shown. A most serious outbreak of this insect occurred in a number of cities in eastern Kansas during the past few years. Here it was abundantly proven that both fruit and shade trees could be completely protected by means of sticky substances such as tanglefoot applied to tar-paper bands around the trunks of the trees. As many as 4,000 and 5,000 insects were frequently counted on a single band during the season. This necessitates frequent stirrings and additions to the sticky substance on the band in order to prevent the bodies of the trapped insects forming a dry bridge over which others might pass. This is not only a means of prevention, but in my judgment the only thoroughly satisfactory way of

dealing with the cankerworm. In the city of Lawrence the first year the cankerworms appeared the shade and fruit trees of the city were practically defoliated. Then the city took steps to protect the trees, and while during the next two seasons the cankerworms appeared to be abundant, there was little or no injury to the foliage, since the banding was thoroughly and consistently conducted. Some large trees that were not banded in the immediate vicinity of Lawrence have since died, being unable to survive the four consecutive defoliations. Furthermore, no spray can prevent some injury, since many buds will be eaten before they open enough to be reached by any poisonous spray.

APPLE-TREE TENT CATERPILLAR.

(*Malacosoma americana* Fabricius.)

Like the cankerworm, this insect may continue through several years, and at times in numbers sufficient to defoliate entire orchards. This insect passes the winter in the egg stage. These are usually laid around smaller twigs of the trees. These egg masses can readily be detected among the naked twigs by the trained eye. If they are promptly removed and destroyed the subsequent injury and expense is eliminated.

FOREST TENT CATERPILLARS.

(*Malacosoma disstria* Hubner.)

Like the previous insect, the winter is passed in the egg stage and the egg masses are readily recognized as abrupt swellings surrounding the smaller twigs, the difference in the egg mass being in the abruptness of the edge of the cylindrical mass of eggs, whereas in the apple tent caterpillar the edge of the egg mass tapers to the twig. This insect, because of its wide range of food plants, is more destructive. The common knowledge of every orchardist should, however, be the ready recognition of these two classes of egg masses and their prompt removal and destruction during the winter months when orchard work is not so pressing.

PEACH-TREE BORER.

(*Sanninoidea exitiosa* Say.)

From 1895 to 1900, during this time I was a graduate student at Cornell University, every conceivable means, both preventive and remedial, were applied to this problem. Every peach grower recognizes how seriously the insect enters into the profits as well as the life of the peach tree. Obviously this borer is one which can best be done away with along preventive lines. A number of these have been tried with varying successes. Among the most favorable are the applications of warm asphaltum with a brush, making the application from five inches below to five inches above the ground, applying about three coats. The California experiment station reports that this prevents the entrance of from ninety-five to ninety-eight per cent of the insects. New Jersey recommends a wash of one pound arsenate of lead in five gallons lime-sulphur at ordinary winter strength, to which has been added an excess of lime. Cornell recommends, as giving fairly good preventive protection, the use of several layers of newspapers or cheap brown paper tied tightly around the trunk at the roots and extending to a height of about two feet above the ground.

FRUIT-TREE BARK BEETLE.

(Scolytus rugulosus Ratzeburg.)

This insect breeds freely in peach, plum, cherry, apricot and apple. Its work can readily be recognized by the numerous small exit holes in the bark, resembling small shot holes; hence the name. They do not seem to breed well in healthy trees, preferring trees that have been weakened by injury or lack of care. If the beetles have entered the bark there is no practical way of reaching them with an insecticide. Seriously affected trees had best be cut down and burned immediately. A pile of firewood from an old apple orchard is likely to furnish a large brood for next year's infestation. Certain deterrent washes have been shown to possess considerable protective value when applied in the spring just before the beetles appear and repeated once or twice during the season. In Georgia the winter strength of the lime-sulphur wash has given fairly good protection.

PLUM CURCULIO.

(Conotrachelus nenuphar Herbst.)

The annual injury to stone fruits through plum curculio is a well-known characteristic of the work of this insect. Curculios thrive only in neglected, overgrown, unpruned and uncultivated orchards such as are surrounded by stone walls, hedges or shaded by woodland. It has been definitely shown that sunlight is hostile to the development of the young curculio in the fallen fruit; hence trees should be properly pruned and all possible hibernating shelter removed, such as brush piles or trash of any kind. If at all possible it is well to allow pigs and chickens to run in the plum orchard to pick up the early spring drops, for such are usually the ones that start the spring brood. Frequent and thorough but shallow cultivation from the middle of July to the middle of August is likely to disturb the development of the pupa in the ground. This insect also affects cherries and peaches, and the work here becomes largely a remedial problem.

TREE CRICKET.

(Ecanthus nigricornis Walker.)

This greenish-white, long-horned cricket deposits, late in the summer, its eggs in punctures in the tissues of various plants, blackberry and raspberry canes being favorites. The eggs are laid in rows of thirty to eighty in a row, and the punctures usually weaken or kill the upper part of the cane. In the case of this insect the first attacks are the ones that make their presence known, and are bound to cause injury, but subsequent injury can be prevented by systematically collecting the affected canes at pruning time and destroying them.

CEDAR RUST.

(Gymnosporangium macropus Link.)

In the case of plant disease one kind only will be referred to, and that is the case of cedar rust on apple. While on a tour of inspection sometime ago in the southern part of the state an orchardist asked me what was the trouble with his apples. There was a peculiar yellowish, horny growth which did not seem to yield to any spray he had tried. When he had planted his orchard he had carefully planted on the west and north of it two rows of red cedar,

and these had grown to maturity with the apple trees, furnishing, as complementary host, abundant spores. This rust of the apple is readily recognized by its yellowish-orange spot on the leaf or upon the fruit or twig. The fungus which brings about this spot maintains a peculiar relation, in that it spends part of its life on another plant, the red cedar, the alternate host of the apple rust. The fungus summers upon the cultivated apple or the wild crab-apple tree. At the approach of winter the rust spores are borne by the wind from the apple tree to an adjacent juniper or red cedar tree. In the spring the red cedars or jumpers produce the well-known cedar apple with yellow tentacles, which become gelatinous during rainy weather. Each of these cedar apples bears an abundance of spores, and these are carried by the wind to near-by apple trees, completing the cycle and starting anew a second generation. Removal of the cedar trees breaks this chain and destroys or concludes the losses to the orchardist.

GRASSHOPPERS.

Grasshoppers sometimes become highly injurious to both fruit and foliage of fruit-bearing plants. Grasshoppers are frequently fastidious in their tastes. I have seen them ascend the trees and eat the fruit away from the pits before attacking the foliage. The eggs of these native grasshoppers are laid in pods in the ground in the fall. If as soon as the ground is fit to be tilled in the early spring, even as early as the first of March, all the unoccupied ground in the vicinity of the fruit plantation is disked to the depth of about two inches, the pods of these insects will be exposed to the weather and as a prey to birds. Out of an undisturbed weed patch or forsaken piece of land may come in the spring enough grasshoppers to call for prompt remedial action in case the egg pods have not been disturbed by shallow cultivation.

These are a few illustrations which go to show the value of an "ounce of prevention." There are many measures which naturally fall under the head of this paper. Among them may be cited inspection laws such as the Kansas state entomological law, which endeavors to vouchsafe to every planter clean, healthy stock, free from injurious insects or plant diseases, and also the federal horticultural inspection law, which endeavors to prevent further introduction of injurious insects and plant diseases from foreign countries. Among the highly injurious insects in this country the majority are aliens, which, I regret to say, cannot be easily deported.

The prevention, however—which might be called the pound of prevention—lies in intelligent culture and well-planned, systematic rotation of crops. This refers not only to the individual but to the community as well. In the matter of other small fruits such as strawberries, which, as you know, are seriously injured at times from insects, such as the leaf rollers and the white grubs, rotation of crops is the best preventive measure.

In our experimental work we have found that well-sprayed orchards show damaging effects on the sides adjacent to neglected orchards. At this season of the year the orchardist can most profitably spend his time in cleaning out all fence corners or weed patches. Surface tillage of the soil both late in the fall and early in the spring disturbs the overwintering stages of many injurious insects. Eternal vigilance intelligently directed is the price of horticultural success, and there can be found many valuable illustrations of such in Kansas to-day.

NOTES OF THE PLUM AND APPLE CURCULIO.

(Conotrachelus neuphar; Anthonomus quadrigibbus.)

E. G. KELLY, Extension Entomologist, Kansas State Agricultural College, Manhattan.

The plum curculio is a native American weevil whose original food was the fruit of the wild plum, hawthorn and wild crab. Its distribution is general over the eastern United States. It readily adapts itself to our cultivated fruits, such as plums, prunes, cherries, peaches and apricots among the stone fruits, and has become one of the most serious enemies of the apple. The injury to fruit is done by both the adult beetle and its grub. The beetle injures the fruit by its feeding and egg-laying punctures. These punctures causing knotty, misshapen fruit, and the egg punctures, with the resulting larvæ, cause the fruit to drop to the ground very early in the season. This pest to our fruit has been recognized as among the most serious, and even though many investigators have spent years on the problem, no fully satisfactory means of control has been devised. Control is particularly difficult because the source of the injury is the beetle, which has a long snout and feeds on the flesh of the fruit obtained through a small puncture in the skin.

The apple curculio is distributed over the eastern United States, generally over about the same territory as the plum curculio, its injury to apples often being confused with that of the other species, for the two species usually work together at the same season and deform the fruit in a similar manner. The reddish-brown apple curculio is readily distinguished from the plum curculio—which is mottled with black, gray and brown—by its much longer and very slender snout and four distinct humps on the posterior of its wing covers.

The plum curculio and its injury to fruit is well known to Kansas orchardists. The apple curculio has only museum records in Kansas, not having been injurious to fruit. According to Prof. George A. Dean, it was quite abundant in 1907. The writer has observed its presence on several occasions in apple orchards in eastern Kansas during the last three years.

The two species, however, must have had a desire to be placed on record in 1920, for very early in the spring they appeared in abundance. The unusually cold, backward spring aided them in their attack. Spraying with arsenate of lead at cluster-bud spraying time seemed to have no effect on them. This, I believe, was because the beetles came from hibernation quite early and filled themselves on tender leaf buds before the blossom buds were sufficiently developed to spray. During the cluster-bud spraying the weather was unusually cool, blooming was retarded, and then again the petal-fall spraying was delayed while waiting for petals to fall. In about six or eight days after the petals dropped the orchards seemed to be alive with the two species working side by side, feeding and depositing eggs. Naturally we expected a heavy drop of fruit and were surprised to see a good crop of cherries (plums were all killed by the Easter freeze), a big crop of peaches, and in July the apples were still on the trees, even though every apple, peach and cherry appeared to have an egg puncture of one or the other or both of these species. The outbreak of the species had its attending enemy in the form of an egg parasite, which reduced the hatching of eggs materially and thus prevented the drop which would ordinarily follow such an abundance of egg deposition.

Much damage was done to peaches and apples by the overwintering beetles of the two species, but the new generation, which began to mature in early July, did far more damage to apples and peaches than did the overwintered beetles at egg-laying time. Spraying with arsenate of lead did not stop them, for the tiny bit of apple skin eaten while making entrance to the flesh did not contain enough poison to kill the insect.

Just why the apple curculio did not go into hibernation soon after becoming an adult I do not know, for that is what it was supposed to have done. It did not, but continued active feeding until mid-August.

MEASURES OF PREVENTION, II.

PROF. S. J. HUNTER, Entomologist, State University, Lawrence.

Last year I talked to you about the "Ounce of Prevention" to be used by the fruit grower. This season I desire to continue this discussion, but to speak of preventive measures now in force both by the state and federal governments to protect Kansas fruit growers.

Over fifty per cent of the insects injurious to agriculture and horticulture are alien enemies brought to us from foreign shores through the various avenues of commerce. If Kansas fruit growers had patronized exclusively Kansas nurseries, and Kansas nurserymen had propagated only Kansas fruit stocks, the San José scale never would have been the problem in Kansas that it is today. Even as the matter stands, very few of the San José infestations now existing in Kansas came through Kansas nurseries, and in every such instance which we have been able to trace the stock had not been propagated by the local nurseryman, but bought from outside territory to supply his trade.

Time will not permit us to speak of all these notably undesirable aliens. A few will suffice to illustrate the point.

THE GYPSY MOTH.

(*Porthetria dispar* Linnaeus.)

The gypsy moth is a native of Europe, Asia and northern Africa. Throughout this region it is a serious menace to orchard and forest trees. It has destroyed vast areas of forests as well as parks and orchards.

In 1869, at Medford, near Boston, a French naturalist, while conducting experiments with silkworms, accidentally permitted some of the insects to escape. These insects attracted no especial attention for about twenty years. In 1889, however, the caterpillars appeared in enormous numbers and excited great alarm by defoliating forests and shade trees. At first the state attempted to exterminate the pests through the expenditure of immense sums of money. In 1900 they gave up the work as impossible and left the gypsy moth to breed undisturbed. In 1905, however, the enormous losses sustained and the increasing area which was suffering forced the state to resume the work of control. In the face, however, of the large expenditures of money both by the state and the federal governments, the gypsy moth has gradually extended its range over eastern Massachusetts, Rhode Island, parts of New Hampshire and southern Maine. In 1920 the spread of the gypsy moth over this area included sixty-two new towns. Colonies of these moths have been found in Connecti-

cut, western Massachusetts and New England. The origin of the infestations in New England is the importation of an enormous block of lumber for planting on a large estate. This was in 1890 and the law was enacted.

The caterpillars seem to prefer on any kind of foliage when driven to the egg stage. These egg masses are round and light brown in color, and of most importance to this Society are attached to the trunks or branches of stone walls, stone piles, or in any case.

The normal number of eggs in a cluster is about the time the buds begin to open. The caterpillars riddle the opening leaves. They are a thread much like the cankerworm and are transported long distances in vehicles and be transported long distances in seven weeks, then transform into adults about seven to seventeen days.

The male flies with a zigzag motion and her wings and generally deposits her eggs and emerges.

The next question is, What is the life of this insect? In its native home the caterpillars are the enemies. For a number of years the caterpillars have been liberating thousands of these forms, and the species in check. Some of these give

On August 20, 1912, however, the law made possible the coöperation of the State and Federal law gives authority to a federal board to hold in check such insects as the caterpillars that any ties, building stone or other material that carry any of the various stages of the caterpillars is permitted to be offered for sale or shipment coming from an infested region and the inspector stating that they have been free of the insect.

THE BROWN-TAIL MOTH

Another well-known and destructive insect was introduced into Massachusetts in the nineties. Late in the nineties its range extended to infest part of Rhode Island, the New Hampshire, southern Maine, and

The brown-tail moth spreads much more rapidly than the female is an active flier and can fly in strong winds. Apple, pear and oak are the favorite food of the brown-tail moths are not only a menace to the fruit but also to the caterpillars, and in a less degree

These are laden with a substance poison to the human skin and bring about what is commonly known as "brown-tail rash." These float in the air and are taken into the air passages of the lungs and have been known to superinduce tuberculosis.

The eggs are deposited in the early part of July and hatch in about twenty days. The young caterpillars feed in colonies on the tender terminal leaves, and web these together with silk in order to form a snug nest. These nests are from two to three inches in length, and in them they usually pass the winter in a half-grown state. In these nests they are readily transported, since these terminal leaves do not fall off and can be seen on the trees after the other leaves have fallen. In one single shipment which was consigned from Europe to Winfield, Kan., we collected and destroyed nests of these insects containing about 5,000 caterpillars. This was shortly after the passage of our own State Entomological Commission law, which gave us permission to inspect and destroy, but before the passage of the federal quarantine law. Had these caterpillars been permitted to escape they would have reached maturity about the middle of June and sufficient egg masses then would have been deposited to serve as an expensive menace to our fruit growers.

These cases illustrate conditions which existed before the enactment of protective legislation by the state and federal governments.

FEDERAL QUARANTINE.

Leading up to the present situation with reference to the protection of the local fruit industry, a federal report says:

"It has been definitely known for many years that plant diseases and insect pests are continually being introduced in this country through the importation of nursery stock and other plants and plant products, and that the results have in many instances been disastrous over wide sections of the country. The so-called plant quarantine act of August 20, 1912 (37 U. S. Stat. at Large, page 315), represents the official recognition of this fact by congress. Under the authority of this act the department has from time to time promulgated a number of quarantines restricting or prohibiting the importation of certain plants and plant products found to have been the cause of disease and infestation. As a real remedy this method has been found in many cases to be entirely inadequate, because it is based largely on the principle of providing against dangers after they have been discovered, when it was often too late, owing to the fact that the damage already had been done and the infestation already had begun to spread. Such a method is in the nature of an attempt to cure rather than to prevent. On the other hand, attempts at prevention, instead of cure, have been made from time to time by provisions for inspection, either in foreign countries, or, upon importation, by federal officials or state authorities. But the method of inspection, as well as that of cure, has been found to be entirely inadequate in many cases.

"Largely because of the havoc which has been wrought by such importations, and also as the result of investigations carried on by the department and the definite scientific information received from reliable sources, it has been felt that something more comprehensive was needed than either a piecemeal quarantine which begins the application of a remedy after the particular injury has begun to operate, or a system of inspection by which in many cases, no matter how conscientious the inspectors may be, it is impossible to discover the harmful disease or pest.

"In illustration of the growing sentiment in the country for an improvement over prevailing methods of preventing the introduction of plant diseases through importations, reference may be made to the resolutions passed January 1, 1918, by the section of horticultural inspection of the American Asso-

ciation of Economic Entomologists, at its meeting in Pittsburgh. At that time recommendations were made (1) for the prohibition of the importations of all nursery stock as defined in the quarantine act of August 20, 1912, except under federal quarantine regulations; (2) immediate absolute embargo against nursery stock with soil around the roots; (3) ultimate prohibition of all kinds of nursery stock, after allowing suitable time for trade adjustment."

The result of these recommendations, together with the extended conferences with the various interests concerned, culminated in the promulgation of quarantine order No. 37, which embodied the above three recommendations.

In any discussion of the purpose and effect of this quarantine order, the fact should not be overlooked that definite provision is made therein for the entry, in limited quantities, even of the prohibited bulbs and plants, through the Government Office of Foreign Seed and Plant Introduction. In such case the importation would be safeguarded by the highly developed quarantine and inspection service of the department, and the country could in this way gradually be supplied with new varieties and the necessary stock for propagation without the dangers attendant upon commercial importations.

Quoting from the Secretary's opinion on this order:

"In view of the facts and considerations above set forth, it is my opinion that plant quarantine No. 37 is scientific in origin and purpose, as well as sound in principle, and that its enforcement will make for the safety of the plant, fruit and forest interests of the country, with as little injury to private agencies and individuals as is compatible therewith."

Compliance with this quarantine order is made possible through the cooperation of the state entomologist and the Federal Horticultural Board. From ports of entry your entomologists are advised of all incoming shipments, of all importations that are being consigned to our territory, and the condition of the shipments as reported by the department inspectors. If these reports show any trace or suspicion of the possible presence of injurious insects or plant diseases the shipment is reinspected at its destination in Kansas. For example, under date of February 8, 1921, we received the following telegram from the Federal Horticultural Board: "French fruit seedlings arriving heavily infested brown-tail moth nests. Urge thorough inspection all shipments your state."

The following circular was also received:

This office has just been advised that since January 1, 1921, twelve shipments of French fruit seedlings have been found to contain nests of the brown-tail moth. These interceptions were made, with the exception of two by federal inspectors in New York city, by officials of the following states: New York, Indiana and North Carolina. In all probability other interceptions have been made by state officials but not reported to this office.

The finding of so many shipments in such a brief period harboring nests of the brown-tail moth would indicate a decided laxity on the part of the French inspectors, and should emphasize the urgent need of careful and consistent examination of all shipments from France coming under your jurisdiction.

The inspectors of the board at the port of first arrival make a cursory inspection of all foreign shipments of nursery stock for the purpose of determining their agreement with the permit, invoice and original certificate of inspection, as to quantity and kind of nursery stock offered for entry, and also as to compliance of the shipment with the other requirements of the regulations. Owing to lack of facilities and inspectors at the port of first arrival, it is possible to make only a superficial examination of a limited number of cases in each shipment. State officials should therefore make careful inspection of all foreign nursery stock, especially

of French origin. Moreover, as indicated in HB-123, dated April 19, 1920, the Federal Horticultural Board heartily recommends the burning of all packing material.

Experiments are under way in Boston to determine the possibility of killing hibernating brown-tail larvæ by vacuum fumigation. In the meantime steps have been taken to have all French shipments given such fumigation as is now required for cotton. If vacuum fumigation will not kill all larvæ contained in nests, it may be necessary to cancel all existing permits for French stock.

Your attention is also called to the repeated finding of nests of the white tree pierid (*Aporia crataegi* L.) on French fruit seedlings. The larva of this insect is a general feeder and is recorded as injuring the foliage of fruit and wild rosaceous plants and oak trees in Europe and is certainly not wanted in this country. Nests of the white tree pierid are usually smaller than those of the brown-tail moth and sometimes do not contain living larvæ. Inasmuch as there is a possibility of confusing the nests of the brown-tail moth and the white tree pierid, it is suggested that if there is any doubt in your mind as to the insect collected it should be forwarded to this office for determination by specialists, after steps have been taken to kill any larvæ which may be contained in the nests.

The French inspection service has been advised by cable of the condition of stock under their certificate arriving in this country, and a warning has been issued to the French exporters and the American importers.

Yours very truly,
E. R. SASSCER,
Entomologist in Charge, Port Inspection.

Approved: C. L. MARLATT, Chairman of Board.

This quarantine order promises subsidiary results: First, the stimulation of propagation of plants heretofore grown only in European countries; second, much closer inspection and cleaner culture of all plants grown in Europe for importation under the supervision of the federal government.

NURSERY STOCK, PLANT AND SEED IMPORTATIONS.

Quarantine 37, which applies new and important prohibitions and restrictions on the entry into the United States of nursery stock, plants and seeds, became effective June 1, 1919. The fiscal year ending June 30, 1920, therefore, represents the first year's record of the enforcement of this quarantine. Under this quarantine three classes of entry are provided for:

1. Entry of fruits, vegetables, cereals, and other plant products which are capable of propagation, intended for medicinal, food or manufacturing purposes; and field, vegetable and flower seeds. These classes are permitted entry without permit or other restrictions, and therefore no record has been kept by the board of such importations.

2. Nursery stock and other plants and seeds for which permit is required but of which unlimited commercial importation is permitted. This class is restricted to five categories, chiefly certain bulbs, fruit stocks and rose stocks and seeds of trees and ornamental shrubs for propagation.

3. Entry of any of the prohibited classes of nursery stock under special permits for the purpose of keeping the country supplied with new varieties and necessary propagating stock; in other words, for the establishment of reproduction enterprises in this country so that as soon as possible this country shall be independent of all foreign supplies of that character.

Time will not permit a detailed description of all the insects which through quarantine are prevented from entering the United States, or, when discovered, are curtailed in their spread.

THE EUROPEAN CORN BORER.

(Pyrausta nubilalis Hubner.)

The European corn borer not only threatens one of our principal grain crops, but likewise is a menace to truck crops. It will feed on sweet corn, field corn and fodder corn, and where corn is not grown it will attack a great variety of other plants, including celery, Swiss chard, green or string beans, beets, spinach, oats, potatoes, tomatoes, turnips, dahlias, chrysanthemums, gladiolus, geraniums, timothy, and several different species of weeds and wild grasses, including barnyard grass, redroot pigweed, dock, ragweed, lamb's-quarters, foxtail grass, lady's thumb, burdock, horseweed, beggars' ticks, purslane, crab grass, scouring rush, panic grass, goldenrod, thistle, apple of Peru, and wild hemp. Further investigations will probably show that other plants are infested.

This European corn borer passes the winter as a full-grown or nearly full-grown larva, or borer, within a tunnel made in its host during the previous summer or fall. These overwintering borers may be detected by the small holes on the surface of the plants, with masses of the frass or castings of the borers extruding therefrom. Upon cutting open the plant the borer can be found within. The head is dark brown or black. The upper surface of the body varies from light brown or dark brown to pink. The under side of the body is flesh colored and devoid of markings.

In April or May, depending on the temperature, the borers begin their feeding. They reach maturity about the middle of May. About this time it cuts a small opening from its tunnel to the surface of the plant and covers it over with a thin partition of silk and then returns to its tunnel to pupate and later to escape through this curtain of silk as an adult moth.

The transition from borer to moth requires about two weeks. Soon after emerging the moths mate and begin to deposit their eggs in irregular masses of from five to fifty eggs on the under side of the leaves. The average number of eggs laid by a single moth is about 350. The eggs hatch in about five to ten days. In about six weeks from the time of hatching this summer borer is full grown and changed to a pupa. About ten days later, or at the close of July, the moths of the second brood have emerged. This second generation deposits about 550 eggs. These eggs hatch in from four to eight days, and this is the brood that attacks the ear corn with great losses.

This insect was first discovered in the United States in 1917 in eastern Massachusetts, though investigations go to show that it had been there for several years previous. Since that time it has been discovered at work in the lake shore region, and effective quarantine measures are now in force.

THE GREEN JAPANESE BEETLE.

(Popillia japonica.)

The green Japanese beetle is a native of Japan and was first found in the United States in Burlington county, New Jersey, and was probably imported in the roots of perennial plants. The rate of increase of this insect is very remarkable. At first only about a dozen of the beetles were found. Three years later one person could collect by hand from 15,000 to 20,000. The beetles are omnivorous, strong fliers and very active during warm days. One year is required to complete the life cycle.

Having passed the winter in the soil, they are ready to emerge about the middle of June. This beetle is a serious menace to small fruits, orchards, cereals and forage crops and to ornamentals. J. J. Davis records having found it feeding on 120 plants. By reason of its strength as a flier, it is going to be difficult to control. It has already spread from its original point of discovery.

Details and life histories of other injurious insects might be given would time permit. The scope of this work can best be understood by a brief reference to the various quarantines and their purposes.

QUARANTINE ORDERS.

The numbers assigned to these quarantines indicate merely the chronological order of issuance of both domestic and foreign quarantines in one numerical series. The quarantine numbers missing in this list are quarantines which have either been superseded or revoked. For convenience of reference these quarantines are here classified as domestic and foreign.

DOMESTIC QUARANTINES.

Date palms. Quarantine No. 6: Regulates the interstate movement of date palms or date-palm offshoots from Riverside county, California, east of the San Bernardino meridian; Imperial county, California; Yuma, Maricopa and Pinal counties, Arizona; and Webb county, Texas; on account of the *Parlatoria* scale (*Parlatoria blanchardi*) and the *Phenacoccus* scale (*Phenacoccus marlatti*).

Hawaiian fruits. Quarantine No. 13 revised: Prohibits or regulates the importation from Hawaii of all fruits and veg tables in the natural or raw state, on account of the Mediterranean fruit fly and the melon fly.

Sugar cane. Quarantine No. 16: Prohibits the importation from Hawaii and Porto Rico of living canes of sugar cane, or cuttings or parts thereof, on account of certain injurious insects and fungous diseases.

Five-leaved pines, Ribes and Grossularia. Quarantine No. 26, as amended: Prohibits the interstate movement of five-leaved pines, currant and gooseberry plants from all states east of and including the states of Minnesota, Iowa, Missouri, Arkansas and Louisiana to points outside of this area; prohibits, further, (1) the interstate movement of five-leaved pines and black-currant plants to points outside the area comprising the states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut and New York, and (2) to protect the state of New York, the movement from the New England states, on account of the white-pine blister rust.

Sweet potato and yam. Quarantine No. 30: Prohibits the movement from the territories of Hawaii and Porto Rico into or through any other territory, state or district of the United States of all varieties of sweet potatoes and yams (*Ipomoea batatas* and *dioscorea* spp.), regardless of the use for which the same are intended, on account of the sweet-potato weevil (*cylas formicarius*) and the sweet-potato scarabee (*Euscepes batatae*).

Banana plants. Quarantine No. 32: Prohibits the movement from the territories of Hawaii and Porto Rico into or through any other territory, state or district of the United States of any species or variety of banana plants (*Musa* spp.), regardless of the use for which the same are intended, on account of two injurious weevils, *Rhabdocnemis obscurus* and *Metamasius hemipterus*.

Black stem rust. Quarantine No. 38: Prohibits the movement interstate to any point outside of the quarantined area of the common barberry and its horticultural varieties, as well as certain other species of *Berberis* and *Mahonia*, on account of the black stem rust of wheat, oats, barley, rye and many wild and cultivated grasses.

European corn borer. Quarantine No. 43, as amended: Regulates the movement interstate to any point outside of the quarantined area of corn and broom corn (including all parts of the stalk), celery, green beans in the pod, beets with tops, spinach, rhubarb, oat and rye straw as such or when used as packing, cut flowers or entire plants of chrysanthemum, aster,

cosmos, zinnia, hollyhock, and cut flowers or entire plants of gladiolus and dahlia, except the bulbs thereof, without stems, on account of the European corn borer (*Pyrausta nubilalis*).

Gypsy moth and brown-tail moth. Quarantine No. 45: Regulates the movement interstate to any point outside of the quarantined towns and territory, or from points in the generally infested area to points in the lightly infested area, of stone or quarry products, and of the plan's and the plant products listed therein. The quarantine covers all the New England states.

Pink bollworm. Quarantine No. 46, as amended: Prohibits the interstate movement from the infested and regulated areas of Texas and Louisiana of cotton, including all parts of the plant, seed cotton, cotton lint, linters, gin waste and all other forms of cotton lint, cotton seed, cottonseed hulls, cottonseed cake and meal, bagging and other containers of the articles enumerated, and also railway cars, boats and other vehicles which have been used in conveying cotton and cotton products grown in the infested districts or which are fouled with such products, hay and other farm products, farm household goods, and farm equipment, except as provided in the rules and regulations supplemental thereto, on account of the pink bollworm of cotton (*Pectinophora gossypiella* Saunders).

Hawaiian and Porto Rican cotton, cotton seed, and cottonseed products. Quarantine No. 47: Regulates the movement of cotton, cotton seed and cottonseed products from Hawaii and Porto Rico on account of the pink bollworm and the cotton blister mite, respectively.

Japanese beetle. Quarantine No. 48, as amended: Regulates the movement interstate to any point outside of certain portions of the counties of Burlington and Camden, New Jersey, and certain portions of the counties of Philadelphia and Bucks, Pennsylvania of (1) farm, garden and orchard products of all kinds; (2) grain and forage crops of all kinds; (3) nursery, ornamental and greenhouse stock and all other plants, including bulbs and cut flowers, and (4) soil, compost and manure other than fresh manure, on account of the Japanese beetle (*Popillia japonica*).

Mexican bean beetle. Quarantine No. 50, with regulations: Prohibits the interstate movement from designated areas in Alabama of (1) fresh or green cultivated beans, including all common garden or field beans, whether string, snap, or shell beans, and including all lima beans, California black-eyed peas or beans, and all green cowpeas and soy beans, but not including velvet beans or English peas or thoroughly dried and cleaned shelled beans or peas of any kind; (2) all forms of "greens," or edible plant leaves, such as those of mustard, chard, spinach, turnips, beets, collards, cabbage and lettuce, and green corn ("roasting ears"), and matured corn in the shuck; and (3) hay and similar forage crops, including alfalfa and pea-vine hay and corn stover, whether baled or loose, and also such forage crops when included with shipments of live stock, except as provided in the rules and regulations supplemental thereto, on account of the Mexican bean beetle (*Epilachna corrupta*).

FOREIGN QUARANTINES.

Irish potatoes. Quarantine No. 3: Prohibits the importation of the common or Irish potato from Newfoundland; the islands of St. Pierre and Miquelon; Great Britain, including England, Scotland, Wales and Ireland; Germany and Austria-Hungary, on account of the disease known as potato wart.

Mexican fruits. Quarantine No. 5, as amended: Prohibits the importation of oranges, sweet limes, grapefruit, mangoes, achras sapotes, peaches, guavas and plums from the republic of Mexico, on account of the Mexican fruit fly.

Five-leaved pines, Ribes and Grossularia. Quarantine No. 7, as amended: Prohibits the importation from each and every country of Europe and Asia, and from the Dominion of Canada and Newfoundland, of all five-leaved pines and all species and varieties of the genera *Ribes* and *Grossularia*, on account of the white-pine blister rust.

Cotton seed and cottonseed hulls. Quarantine No. 8, as amended: Prohibits the importation from any foreign locality and country, excepting only the locality of the Imperial valley, in the state of Lower California, Mexico, of cotton seed (including seed cotton) of all species and varieties, and cottonseed hulls, on account of the pink bollworm. Cotton and cotton seed from the Imperial valley may be entered under permit and regulation.

Seeds of avocado or alligator pear. Quarantine No. 12: Prohibits the importation from Mexico and the countries of Central America of the seeds of the avocado or alligator pear, on account of the avocado weevil.

Sugar cane. Quarantine No. 15: Prohibits the importation from all foreign countries of living canes of sugar cane, or cuttings or parts thereof, on account of certain injurious insects and fungous diseases. There are no restrictions on the entry of such materials into Hawaii and Porto Rico.

Citrus nursery stock. Quarantine No. 19: Prohibits the importation from all foreign localities and countries of all citrus nursery stock, including buds, scions and seeds, on account of the citrus canker and other dangerous citrus diseases. The term "citrus," as used in this quarantine, includes all plants belonging to the subfamily or tribe *Citrateæ*.

European pines. Quarantine No. 20: Prohibits, on account of the European pineshoot moth (*Evectria buoliana*), the importation from all European countries and localities of all pines not already excluded by quarantine No. 7.

Indian corn or maize and related plants. Quarantine No. 24, as amended: Prohibits the importation from southeastern Asia (including India, Siam, Indo-China, and China), Malayan Archipelago, Australia, New Zealand, Oceania, Philippine Islands, Formosa, Japan, and adjacent islands, in the raw or unmanufactured state, of seed and all other portions of Indian corn or maize (*Zea mays* L.), and the closely related plants, including all species of teosinte (*Euchlana*), Job's tears (*Coix*), *Polytoca*, *Chionachne* and *Sclerachne*, on account of the downy mildews and *Physoderma* diseases of Indian corn, except that Indian corn or maize may be imported under permit and upon compliance with the conditions prescribed in the regulations of the Secretary of Agriculture.

Citrus fruit. Quarantine No. 28: Prohibits the importation from eastern and southeastern Asia (including India, Siam, Indo-China, and China), the Malayan Archipelago, the Philippine Islands, Oceania (except Australia, Tasmania and New Zealand), Japan (including Formosa and other islands adjacent to Japan), and the Union of South Africa, of all species and varieties of citrus fruits, on account of the citrus canker, except that oranges of the mandarin class (including satsuma and tangerine varieties) may be imported under permit and upon compliance with the conditions prescribed in the regulations of the Secretary of Agriculture.

Sweet potato and yam. Quarantine No. 29: Prohibits the importation for any purpose of any variety of sweet potatoes or yams (*Ipomoea batatas* and *Dioscorea* spp.) from all foreign countries and localities on account of the sweet-potato weevils (*Cylas* spp.) and the sweet-potato scarabee (*Euscepes batatae*).

Banana plants. Quarantine No. 31: Prohibits the importation for any purpose of any species or variety of banana plants (*Musa* spp.), or portions thereof, from all foreign countries and localities, on account of the banana root borer (*Cosmopolites sordidus*).

Bamboo. Quarantine No. 34: Prohibits the importation for any purpose of any variety of bamboo seed, plants or cuttings thereof capable of propagation, including all genera and species of the tribe Bambuseæ, from all foreign countries and localities, on account of dangerous plant diseases, including the bamboo smut (*Ustilago shiraiana*). This quarantine order does not apply to bamboo timber consisting of the mature dried culms or canes which are imported for fishing rods, furniture making, or other purposes, or to any kind of article manufactured from Bamboo, or to bamboo shoots cooked or otherwise preserved.

Nursery stock, plants, and seeds. Quarantine No. 37, as amended, with regulations (effective on and after June 1, 1919): Prohibits the importation of nursery stock and other plants and seeds from all foreign countries and localities, on account of certain injurious insects and fungous diseases, except as provided in the regulations. Under this quarantine the following plants and plant products may be imported without restriction: Fruits, vegetables, cereals, and other plant products imported for medicinal, food or manufacturing purposes, and field, vegetable and flower seeds. The entry of the following plants is permitted under permit: Lily bulbs, lily of the valley, narcissus, hyacinths, tulips and crocus; stocks, cuttings, scions and buds of fruits; rose stocks, including manetti, multiflora, briar rose, and *rosa rugosa*; nuts, including palm seeds; seeds of fruit, forest, ornamental and shade trees; seeds of deciduous and evergreen ornamental shrubs, and seeds of hardy perennial plants.

Provision is also made for the issuance of special permits under safeguards to be prescribed in such permits for the entry in limited quantities of nursery stock and other plants and seeds not covered in the preceding lists for the purpose of keeping the country supplied with new varieties and necessary propagating stock.

Flag smut and take-all. Quarantine No. 39, with regulations: Prohibits the importation of seed or paddy rice from Australia, India, Japan, Italy, France, Germany, Belgium,

Great Britain, Ireland and Brazil on account of two dangerous plant diseases known as flag smut (*Urocystis tritici*) and take-all (*Ophiobolus graminis*). Wheat, oats, barley and rye may be imported from the countries named only under permit and upon compliance with the conditions prescribed in the regulations of the Secretary of Agriculture.

European corn borer. Quarantine No. 41, with regulations: Prohibits the importation of the stalk and all other parts, whether used for packing or other purposes, in the raw or unmanufactured state, of Indian corn or maize, broom corn, sweet sorghums, grain sorghums, Sudan grass, Johnson grass, sugar cane, pearl millet, napier grass, teosinte and Job's tears, from all foreign countries and localities, except as provided in the rules and regulations supplemental thereto, on account of the European corn borer (*Pyrausta nubilalis*) and other dangerous insects and plant diseases.

Mexican corn. Quarantine No. 42, with regulations: Prohibits the importation of Indian corn or maize from Mexico, except as provided in the rules and regulations supplemental thereto, on account of the contamination of such corn with cotton seed more or less infested with the pink bollworm.

Stocks, cuttings, scions and buds of fruits. Quarantine No. 44: Prohibits the importation of stocks, cuttings, scions and buds of fruits from Asia, Japan, Philippine Islands and Oceania (including Australia and New Zealand) on account of dangerous plant diseases, including Japanese apple cankers, blister blight and rusts, and injurious insect pests, including the oriental fruit moth, the pear fruit borer, the apple moth, etc.

Citrus black fly. Quarantine No. 49, with regulations: Prohibits the importation of fruits and vegetables, and of plants or portions of plants used as packing material in connection with shipments of such fruits and vegetables, or otherwise, from Cuba, the Bahamas, Jamaica, Canal Zone, Costa Rica, India, Philippine Islands, Ceylon and Java, except as provided in the rules and regulations supplemental thereto, on account of the citrus black fly (*Aleurocanthus woglumi*).

OTHER RESTRICTIVE ORDERS.

The regulation of the entry of nursery stock from foreign countries into the United States was specifically provided for in the plant-quarantine act. The act further provides for the similar regulation of any other class of plants or plant products when the need therefor shall be determined. The entry of the plants and plant products listed below has been brought under such regulation:

Nursery stock. The conditions governing the entry of nursery stock and other plants and seeds from all foreign countries and localities are indicated above under "Foreign Quarantines." (See Quarantine No. 37.)

Irish potatoes. The importation of Irish potatoes is prohibited altogether from the countries enumerated in the potato quarantine. Potatoes may be admitted from other foreign countries under permit and in accordance with the provisions of the regulations issued under the order of December 22, 1913, bringing the entry of potatoes under restriction on account of injurious potato diseases and insect pests. Importation of potatoes is now authorized from the following countries: Denmark, Cuba, Bermuda and the Dominion of Canada. The regulations issued under this order have been amended so as to permit, free of any restrictions whatsoever under the plant-quarantine act, the importation of potatoes from any foreign country into the territories of Porto Rico and Hawaii for local use only, and from the Dominion of Canada and Bermuda into the United States or any of its territories or districts.

Avocado, or alligator pear. The order of February 27, 1914, prohibits the importation from Mexico and the countries of Central America of the fruits of the avocado, or alligator pear, except under permit and in accordance with the other provisions of the regulations issued under said order, on account of the avocado weevil. Entry is permitted through the port of New York only and is limited to the large, thick-skinned variety of the avocado. The importation of the small, purple, thin-skinned variety of the fruit of the avocado and of avocado nursery stock under eighteen months of age is prohibited.

Cotton. The order of April 27, 1915, prohibits the importation of cotton from all foreign countries and localities, except under permit and in accordance with the other provisions of the regulations issued under said order, on account of injurious insects, including the pink bollworm. These regulations apply in part to cotton grown in and imported from the Imperial valley, in the state of Lower California, in Mexico.

Corn. The order of March 1, 1917 (Amendment No. 1, with Regulations, to Notice of Quarantine No. 24), prohibits the importation of Indian corn or maize in the raw or unmanufactured state from the countries and localities listed in Notice of Quarantine No. 24, except under permit and in accordance with the other provisions of the regulations issued under said order, on account of injurious diseases of Indian corn.

Cottonseed products. The order of June 23, 1917, prohibits the importation of cottonseed cake, meal, and all other cottonseed products, except oil, from all foreign countries, and a second order of June 23, 1917, prohibits the importation of cottonseed oil from Mexico, except under permit and in accordance with the other provisions of the regulations issued under said orders, on account of injurious insects, including the pink bollworm.

Citrus fruits. The order of June 27, 1917 (Notice of Quarantine No. 28, with Regulations), prohibits the importation from the countries and localities listed therein of all species and varieties of citrus fruits, excepting only oranges of the mandarin class (including satsuma and tangerine varieties), on account of the citrus-canker disease. Oranges of the mandarin class (including satsuma and tangerine varieties) may be imported under permit and in accordance with the other provisions of the regulations issued under said order.

Indian corn, broom corn and related plants. The order of February 21, 1920 (Notice of quarantine No. 41, with Regulations), prohibits the importation in the raw or unmanufactured state of the stalk and all other parts of Indian corn or maize, broom corn, sweet sorghums, grain sorghums, Sudan grass, Johnson grass, sugar cane, including Japanese varieties, pearl millet, napier grass, teosinte, and Job's tears from all foreign countries and localities on account of the European corn borer and other dangerous insects and plant diseases. The regulations issued under said order permit the importation without restriction of sorghum hay from Canada and clean shelled or threshed grain, from any country, of the plants covered by this order. Provision is also made for the importation of broom corn under permit and in accordance with the other provisions of the regulations for manufacturing purposes.

Mexican corn. The order of February 21, 1920 (Notice of Quarantine No. 42, with Regulations), prohibits the importation of Indian corn or maize from Mexico, except under permit and in accordance with the other provisions of the regulations issued under said order, on account of contamination of such corn with cotton seed more or less infested with the pink bollworm.

Stocks, cuttings, scions and buds of fruits. The order of March 24, 1920 (Notice of Quarantine No. 44), prohibits the importation of stocks, cuttings, scions and buds of fruits for or capable of propagation from Asia, Japan, Philippine Islands and Oceania (including Australia and New Zealand) on account of certain dangerous plant diseases and injurious insect pests. Provision is made for the importation, under special permits issued by the Secretary of Agriculture, of limited quantities of stocks, cuttings, scions and buds of fruits from the countries and localities named for the purpose of keeping the country supplied with new varieties and necessary propagating stock.

Another phase of this question is the introduction into this country of parasitic and predacious enemies which serve to hold these unwelcome alien insects in check in their native countries. But this is another story which I may be able to talk to you about at some future meeting.

GREETINGS FROM MINNESOTA.

[In accepting his place as a delegate, Hon. J. C. Traxler made the following observations:]

Mr. President, and Members of the Kansas State Horticultural Society: As the accredited delegate of the Minnesota Horticultural Society, and also as the accredited delegate of the Northwestern Peony and Iris Society, I have the distinguished privilege and the very great pleasure to greet you in the name of these two great societies, and on their behalf to congratulate you on the splendid success you have attained in the great good work for the betterment of the people of our generation.

Your work, like ours, has for its fundamental basic principle the betterment

of the homes of our people. Whatever tends to the improvement of the farms, orchards and of the gardens and makes them more productive and attractive contributes to the betterment of the homes, not merely to the homes on the particular farm or orchard, but to all homes everywhere. As our farms, our orchards and our gardens increase in their productivity they add to the general wealth of the nation and to the common good to all. This increased productivity benefits first the producer, and you see the result reflected in the betterment of his own home. Increased production tends to make better living possible for all, and the result is promptly reflected in the general uplift of the homes.

In this great democracy the strength of our nation depends upon the quality of its homes. The stronger and better the homes of its people, the stronger and better the nation.

Your operations and your endeavors are limited chiefly to the great commonwealth of Kansas, while ours are confined to that of Minnesota, but we are working together to one common end—to better the condition of our people. Your work and ours has produced wonderfully satisfactory results. Compared with the homes of the peoples of foreign countries, the homes of your people of Kansas and the homes of our people of Minnesota are palaces of luxury. Sister states have followed our example, with the same satisfying results. Boastful as it may seem, I proudly declare that your great Society and ours rank second to none.

In the names and on behalf of the great organizations which here I have the privilege to represent, I congratulate you on the work which you have done. In their names I congratulate you on your courageous undertakings for future work.

Since our objects are common, our work should be coöperative. To the full extent of my authority as a delegate, I pledge you their hearty coöperation and support.

ANNUAL MEETINGS.

APPOINTMENT OF COMMITTEES.

At the fifty-fourth annual meeting President Holsinger announced the standing committees, as follows:

Awards: W. E. Koehring, Robert Steele, Carl Snyder.
Auditing: James N. Farley, F. P. Rude, A. F. Baker.
Membership: F. W. Dixon, James Sharpe, W. A. S. Bird.
Obituary: F. L. Kenoyer, Geo. W. Kinkead, Albert Dickens.
Resolutions: I. D. Graham, Mrs. Theo. Saxon, C. S. Ritter.
Weights and Measures: E. F. Stimpson, W. B. Vining, F. P. Rude, F. W. Dixon, L. E. Call.

At the fifty-fifth annual meeting President Vining announced the standing committees, as follows:

Awards: W. L. Lux, L. C. Williams.
Auditing: James Farley, John McNoun, F. P. Rude.
Membership: F. W. Dixon.
Obituary: F. L. Kenoyer, B. H. Gragg, Mrs. Saxon.
Resolutions: A. L. Brooke, C. A. Scott, W. A. Harshbarger.
Needed Legislation: C. S. Ritter, James Sharpe, G. W. Kinkead.

REPORT OF COMMITTEE ON RESOLUTIONS, 1920.

WHEREAS, We have a pure-food law in the State of Kansas and to those in authority whose duty it is to see that the provisions of this law are enforced. We wish to call attention to the continued use of artificial fruit flavors and adulterated fruit juices that are dispensed at soda fountains and other similar places. The public is entitled to protection from such adulterants, and the fruit-growing industry is entitled to fair treatment in that it should not be compelled to compete with coal-tar productions and other dangerous adulterations: therefore, be it

Resolved, That we recommend to the Kansas State Board of Health that it enforce the law to the limit in the interest of the general public. We further recommend that a copy of this resolution be furnished the Kansas State Board of Health.

Resolved, That it is the sense of the Kansas State Horticultural Society that congress should establish a national standard of all weights and measures; and be it further

Resolved, That a copy of this resolution, duly certified, be transmitted by the secretary to Senators Curtis and Capper and to each of our members in congress, with the request that they exercise their influence in the enactment of such a law.

WHEREAS, Irrigation and drainage are essentially closely allied to agriculture and horticulture, and it is the consensus of opinion of the Kansas State Horticultural Society that these matters should be controlled by the Department of Agriculture; therefore, be it

Resolved, by the Kansas State Horticultural Society, That the matters of irrigation and drainage should not be transferred to the Court of Industrial Relations, but should be placed and included in the Department of Agriculture.

WHEREAS, The adverse economic situation which confronts the farmers of this nation to-day is the result of conditions brought about by the Great War and is beyond the power of the individual farmer to correct; and

WHEREAS, We believe that coöperative marketing of farm products affords the only means by which the individual farmer can better his financial status and at the same time help to restore American agriculture to its normal condition: therefore, be it

Resolved, That this Society be recorded as strongly indorsing the principle of coöperative buying and selling among farmers as the most effective means of righting the present conditions, and that we express the belief that this can be best accomplished by means of a state marketing bureau, such as now exists in thirty-five other states and the Department of Agriculture at Washington. We urge that this matter be made the subject of investigation and action by our legislature at the forthcoming session of the legislature.

WHEREAS, The surroundings of a state capitol should be the ideal expression of the state, and as such should create a favorable impression upon our citizens as well as upon visitors: therefore, be it

Resolved, by the Kansas State Horticultural Society, That we deplore the condition in which the statehouse grounds are allowed to remain, and we condemn the common practice of using its lawn as a highway, to the neglect of the walks which are provided for all necessary traffic, and we call upon the authorities to properly improve, embellish and protect these grounds.

WHEREAS, It is evident that if the signboard industry is permitted to continue unmolested it will soon succeed in the despoliation of the beauty along our highways; therefore, be it

Resolved, That the Kansas State Horticultural Society institute a statewide propaganda to arouse an indignant public sentiment against the signboard interests and certain advertisers who are defacing the beautiful views along our highways with unsightly signboards; and be it further

Resolved, That the Kansas State Horticultural Society invite all other organizations which are interested in having the natural scenery along the public highway protected and conserved to coöperate in suppressing the signboard vandalism.

REPORT OF COMMITTEE ON RESOLUTIONS, 1921.

It has long been the custom of organized bodies to express the consensed opinion of such associations on subjects which pertain to the affairs of that association and otherwise: therefore, we the members of the Kansas State Horticultural Society, at this fifty-fifth annual meeting express ourselves as follows:

As good citizens of our beloved state and country, we hereby pledge ourselves anew to the total prohibition of the use of all alcoholic beverages. We will never consent by vote or otherwise to the repeal of the amendment to the constitution of our state, or that of the general government which prohibits this traffic. Such repeal would be a step backward and downward in the course of civilization.

We are informed that the public schools of Kansas rank twenty-seventh among the states. There must be some defect underlying the management of our school system. One fault is with the textbooks in use in the schools, which are faulty in construction, and it is a well-known fact that Kansas is outranked by other states in this particular. We would respectfully call this to the attention of those in authority and ask that this defect be remedied. Efficiency and excellence is our standard and the best is none too good for the children of this state.

In these *post bellum* days, when everything seems to be awry and nothing seems to find its proper place, let us stop and reflect. Let us practice economy and more thrift than we have in these few years of rush and extravagance. Our domestic affairs are not nearly so bad as we may imagine. The present is a better time, perhaps, to cultivate a spirit full to the overflow of patriotism than in times of immediate danger and conflict. Keep steady, shoulder to shoulder, with a cool and a clear mind and all is well.

We wish here to express to the officers of our Society our appreciation of their efforts, and pledge ourselves to give them our best aid in their future endeavors.

IN MEMORIAM.

DR. EVA HARDING was born in Ohio in 1857 and died in Topeka, Kan., July 27, 1920. She joined this Society in 1908.

Doctor Harding was a tireless worker for the upbuilding of her community and her adopted state. She was a successful practicing physician and was very liberal in her contributions to the enterprises the aim of which was bettering humanity.

She had many convictions and maintained each one of them in a very vigorous manner. Her love of the beautiful led her to be an enthusiast in the production of flowers, in which she greatly excelled, and was accorded the dis-

tion of being the most expert judge among the great number of florists of her community.

She was a Christian; she advocated prohibition; she was a champion for the emancipation of woman. She avowed her convictions.

GERALD L. HOLSINGER was born in Rosedale, Kan., July, 1870, and died in September, 1920, at Rosedale. Mr. Holsinger was a graduate of the United States Naval Academy and served his country in two wars, the Spanish-American and the World War.

Although Mr. Holsinger was educated for warlike service, he was a very quiet, peaceful citizen, and with the exception of school days and the time while he was serving his country he was devoting his energies to the production of fruit trees and fruit for his fellowman.

Mr. Holsinger leaves a wife and one son, and a mother, three sisters and two brothers to mourn his loss. He was a member of this Society for twenty-three years.

ARTHUR WILLIS was born in Delavan, Wis., March 18, 1843, and died at Ottawa, Kan., October 1, 1920. Mr. Willis conducted a successful nursery business for about fifty years. He was a citizen in all that is applied to that word. He served his city and community faithfully and was officially connected with the Ottawa University for more than thirty-five years, and among other endowments he contributed, on the annuity plan, \$10,000 to the permanent funds of this University. Mr. Willis is survived by his widow, one son and two daughters.

He left a host of friends in many parts of the state, who mourn for him as one personal friend mourns for another. Mr. Willis joined this Society in 1903.

JAMES E. REMSBURG was born near Fremont, Ohio, January 7, 1848, and died in California September 23, 1919. He came to Kansas in 1868. He was a horticulturist and student during his entire life. He was a soldier, serving his country from Ohio during the Civil War.

He was county superintendent of Atchison county for four years and editor of the *Weekly Kansan* for ten years. He was a lecturer of more than national prominence. He delivered more than 3,000 addresses. He was known internationally as an author, and several of his books and lectures were translated into all of the prominent languages.

He was a life member of the Kansas State Horticultural Society, of the Author's Club (London), National Geographic Society, American Secular Union, and the Thomas Paine National Historical Association.

ALFRED B. SMITH was born in New York in 1848, and died in Topeka, October, 1920, at the age of seventy-two.

Mr. Smith was the first citizen to plant a commercial cherry orchard in Shawnee county. His cherry orchard of ten acres furnished Topeka and

vicinity with fruit for many years. He also fruited a large acreage of raspberries. He was much interested in horticulture in its many branches. He is missed by his many friends and members of this Society.

MRS. SARAH A. SMITH, wife of Alfred B. Smith, was born in Ohio in 1851, and died in Topeka, March, 1920, aged sixty-nine years.

Mrs. Smith was a pioneer in Kansas and saw the development of horticulture from its natural state to the cultivated horticultural creations of to-day. She leaves to her friends the memory of an active Christian life, much of which was spent for the benefit of humanity.

A. T. DANIELS. In the death of A. T. Daniels the Society has lost a valued friend who did much for the beautifying of this community and much for increasing the appreciation of his fellowmen for hardy perennial plants. Mr. Daniels grew many varieties of peonies, and his collection of irises was one of the largest and most desirable in the West.

CHARLES H. LONGSTRETH was born in Monmouth, N. J., March 30, 1842. He died at his home in Lakin, Kan., January 29, 1921. He leaves a wife, a son and two daughters.

During the Civil War he enlisted as a musician in company F, Seventh New Jersey infantry. He came to Kansas in March, 1869, locating at Williamsburg. Through the influence of S. T. Kelsey he became interested in forestry in Kansas. In 1880 he became locating agent for the Atchison, Topeka & Santa Fe Railway Company.

He moved to Kearny county, Kansas, in 1884, the year that he became a member of the Kansas State Horticultural Society. Mr. Longstreth planted the first orchard in Kearny county. He received prizes for his fruit exhibits at Boston and Denver. He was a very successful grower of shade trees and ornamentals as well as fruit trees.

SAMUEL TRUMAN KELSEY was born in Montgomery county, New York, November 14, 1832, and died November 5, 1921, in his eighty-ninth year, in Salem, Mass.

He taught school a few years after graduating from a normal school, and then went to Bloomington, Ill., where he was employed in a nursery of 600 acres, and by diligence he soon became foreman of the nursery. He continued with the nursery until 1865, and during this time he made many excursions to eastern and northern woods collecting forest seedlings for distribution and planting over the prairie lands. He was the pioneer in forestry in this

country. He believed that he could accomplish more by propagating forests on western treeless lands than by contesting with the forest destroyers in the East, and he decided to go west and grow up with the country. He made the first large forest-tree plantation in this country. He was a charter member of the Kansas State Historical Society, becoming a member in 1869. With his death the last charter member of our Society has passed into the beyond.

FRANK HASKINS STANNARD was born December 25, 1857, at Lamoille, Bureau county, Illinois. Mr. Stannard passed to his reward on Thursday, March 30, 1922, at Ottawa, Franklin county, Kansas.

Mr. Stannard was nationally known as a nurseryman, and in Kansas as the successful proprietor of the Ottawa Star Nurseries. He served his adopted state as a legislator in the senate as well as in the house. He, with other horticulturists, was responsible for the creation of the Entomological Commission, and represented the nursery interests on the commission from the time it became a law until his death. He was a truly representative citizen. He was a member of the board of trustees of the First Baptist Church of Ottawa and also a trustee of the Ottawa University, having been elected to that position in 1895. Mr. Stannard left an estate of about \$300,000.

REPORT OF COMMITTEE ON WEIGHTS AND MEASURES, 1920.

WHEREAS, The present state laws on weights and measures in section 11721 of the General Statutes of 1915 establishes a standard of weight per bushel which is not in accordance with the actual weight for certain commodities; therefore, be it

Resolved, That the Kansas State Horticultural Society recommend to the coming session of the legislature that the weight per bushel of the commodities be changed as follows:

Apples	from 50 pounds to 48 pounds per bushel.
Beans, unshelled, green.....	from 38 pounds to 30 pounds per bushel.
Beets	from 60 pounds to 56 pounds per bushel.
Onions	from 57 pounds to 55 pounds per bushel.
Pears	from 45 pounds to 50 pounds per bushel.
Peas, green, in pods	from 56 pounds to 30 pounds per bushel.
Spinach	from 30 pounds to 14 pounds per bushel.

EDWIN F. STIMPSON, Lawrence, *Chairman*.
 F. W. DIXON, Holton.
 W. B. VINING, Piper.
 F. P. RUPE, North Topeka.

Agreeable to the resolution passed at the fifty-fourth annual meeting of the Kansas State Horticultural Society, there was prepared a bill in reference to weights of certain commodities. This bill was introduced in both houses and duly enacted into a law. The following is the legal weight per bushel of the enumerated articles:

<i>Articles.</i>	<i>Pounds.</i>	<i>Articles.</i>	<i>Pounds.</i>
Alfalfa seed	60	Nuts, hickory	50
Apples	48	Oats	32
Apples, dried	24	Onions	55
Barley	48	Parsnips	48
Beans	60	Peaches	48
Beans, unshelled, green	38	Peaches, dried	38
Beans, castor	46	Pears	50
Beets	56	Peas	60
Blue-grass seed, native	14	Peas, green, in pods	30
Blue-grass seed, English	22	Plastering hair, washed	4
Broom-corn seed	30	Plastering hair, unwashed	8
Buckwheat	48	Plums	52
Cane seed	50	Popcorn, on cob	70
Carrots	50	Popcorn, shelled	56
Cherries, without stems	64	Potatoes	60
Cherries, with stems	56	Quinces	48
Clover seed	60	Rutabagas	50
Corn, shelled	56	Rye	56
Corn in the ear, husked	70	Salt	30
Cucumbers	48	Sorghum seed	50
Flaxseed (linseed)	56	Spelt or emmer	40
Feterita	56	Spinach	14
Grapes, with stems	48	Sudan-grass seed	40
Grapes, without stems	60	Sweet potatoes	50
Hemp seed	44	Sweet potatoes, seed (sorted 1¼ inches in diameter and under)	45
Kafir corn	56	Timothy seed	45
Lime, unslacked	30	Tomatoes	56
Malt	38	Turnips	55
Millet seed, Hungarian	50	Wheat	60
Milo maize	56		
Nuts, black walnut	50		

W. A. S. BIRD: Yesterday I read a resolution that it was the sense of this body that congress should establish a standard of weights and measures for all communities. That matter is now before some committee or bureau which is working that out. They have fixed measures to a certain extent, such as the gallon, bushel and barrel, but so far as I know they have not undertaken to establish any weights whatever. They have fixed the size of certain measures in which goods are shipped in interstate commerce. Now, in my judgment the time has absolutely come when we should get away from the proposition of measuring things except by weight. Now we have a standard of sixty-pounds of wheat as a bushel, and yet we all know that some wheat of the 1919 crop made only forty-one pounds for a bushel, so that when we went to sell a bushel of wheat we had to sell nearly a bushel and a half. Now the fallacy of it is something ridiculous. I think I have voted for three different laws on this floor changing weights in the last fifteen years. Only in 1917 I voted for the measure introduced by Representative Neiswender, of this county, establishing a scale of weights for certain commodities, some of which have been named here, which were presented to him by the Food and Drug Department of this state. Now, then, you are going to work and change those weights that a state

department here asked to have established. Now, that is the way we legislate in Kansas. One legislature passes a law and the next legislature tears it to pieces. I think it may be all right to recommend to the legislature the adoption of this measure until congress shall have fixed this, but when we pass one resolution directed to the Kansas legislature and another to the national congress it looks foolish on our part. Now, whatever is best to do I want to do it.

A. L. BROOKE: I am perfectly willing to accept what the United States government does when they do it, but they never have done it. A bushel of apples should not weigh more than a bushel of pears. Every man who has ever handled the two commodities knows that pears weigh the more. I move that the secretary be instructed to have two bills embodying that resolution drawn up, one to be presented to the senate and one to the house.

REPORT OF COMMITTEE ON NEEDED LEGISLATION.

Your committee on needed legislation makes the following report:

First. That the legal status, scope and detail work of this Society should be broadened and more clearly defined by the legislature.

Second. That for the purpose of increasing the production of fruit in Kansas, the organization and encouragement of local and county horticultural societies should be fostered by statute. The control of insect and fungous pests, that by reason of the operation of natural laws under which they work are too numerous and widespread to be successfully combated by individual effort.

Third. That for the purpose of securing uniformity in inspecting, grading and packing and marketing horticultural products, authority should be conferred on the State Horticultural Society to prepare and enforce such rules and regulations as will protect the interests of the producers and of consumers from unfair competition, discrimination, extortion and profiteering.

Fourth. The successful production of fruit depends on the control of insect pests and fungous diseases. This control is difficult for the individual. A law should be enacted aiding the fruit interests by compulsory spraying and a fund provided for the enforcement of such a law.

Fifth. In view of the fact that the testing of varieties for hardiness, immunity from disease, and general commercial value requires time, we believe that our State Experiment Station should be provided with ample land for permanent testing ground for fruits, ornamental plants and forest species. The great difference in the conditions of the two great fruit-growing sections makes it desirable that testing orchards be established in the northeast section and also in the Arkansas valley, as well as at the state farms at Manhattan.

REPORT OF THE AUDITING COMMITTEE FOR 1920.

The report of the auditing committee showed the treasurer's accounts to be correct with a balance on hand of \$520.67, December 23, 1920.

JAMES FARLEY.
JOHN MCNOWN.
F. P. RUDE.

REPORT OF THE AUDITING COMMITTEE FOR 1921.

The report of the auditing committee reported the books of the treasurer to be well kept, with a balance on hand of \$577.87, December 23, 1921.

JAMES FARLEY.

A. F. BAKER.

REPORT OF COMMITTEE ON MEMBERSHIP, 1920.

The committee on new members for 1920 report the following new life members: J. M. Butler, Kansas City, Kan.; Mason Drug and Chemical Company, Hancock, Md.; C. F. Menninger, Topeka; B. G. Pratt Company, New York; P. G. Showacre, Cumberland, Md.; J. H. Skinner, North Topeka; R. B. Steele, Topeka; E. F. Stimpson, Lawrence.

Annual members: Mrs. J. A. Bacon, Holton; A. T. Daniels, Topeka; William Freienmuth, Tonganoxie; Jesse Haney, Topeka; Abner Hood Company, Kansas City, Mo.; Grant E. Kelsey, Oakland; William Lytle, Topeka; E. H. Nolte, St. Joseph, Mo.; Julia Niles, Topeka; George W. Owen, Kansas City, Kan.; B. W. Quisenberry, Rogers, Ark.; Carl Snyder, Topeka.

REPORT OF COMMITTEE ON MEMBERSHIP, 1921.

The committee on new members for 1921 report the following new life members: C. H. Glover, Wichita; John Hildebrandt, Salina; George W. Owen, Kansas City, Kan.

Annual members: J. A. Bacon, Holton; John Hartung, Iola; D. J. Mackey, Pittsburg; Julia Niles, Topeka; E. H. Nolte, St. Joseph, Mo.; W. S. Weidorn, Manhattan; Sherwin-Williams, Kansas City, Kan.; L. C. Williams, Manhattan; John W. Wilkinson, Topeka.

ELECTION OF OFFICERS.

The election of 1920 resulted as follows:

W. B. Vining, president; James Sharpe, vice president; O. F. Whitney, secretary; F. W. Dixon, treasurer.

Trustees: M. E. Chandler, second district; James Homer Sharpe, fourth district; J. B. Polka, sixth district; J. G. Maxwell, eighth district.

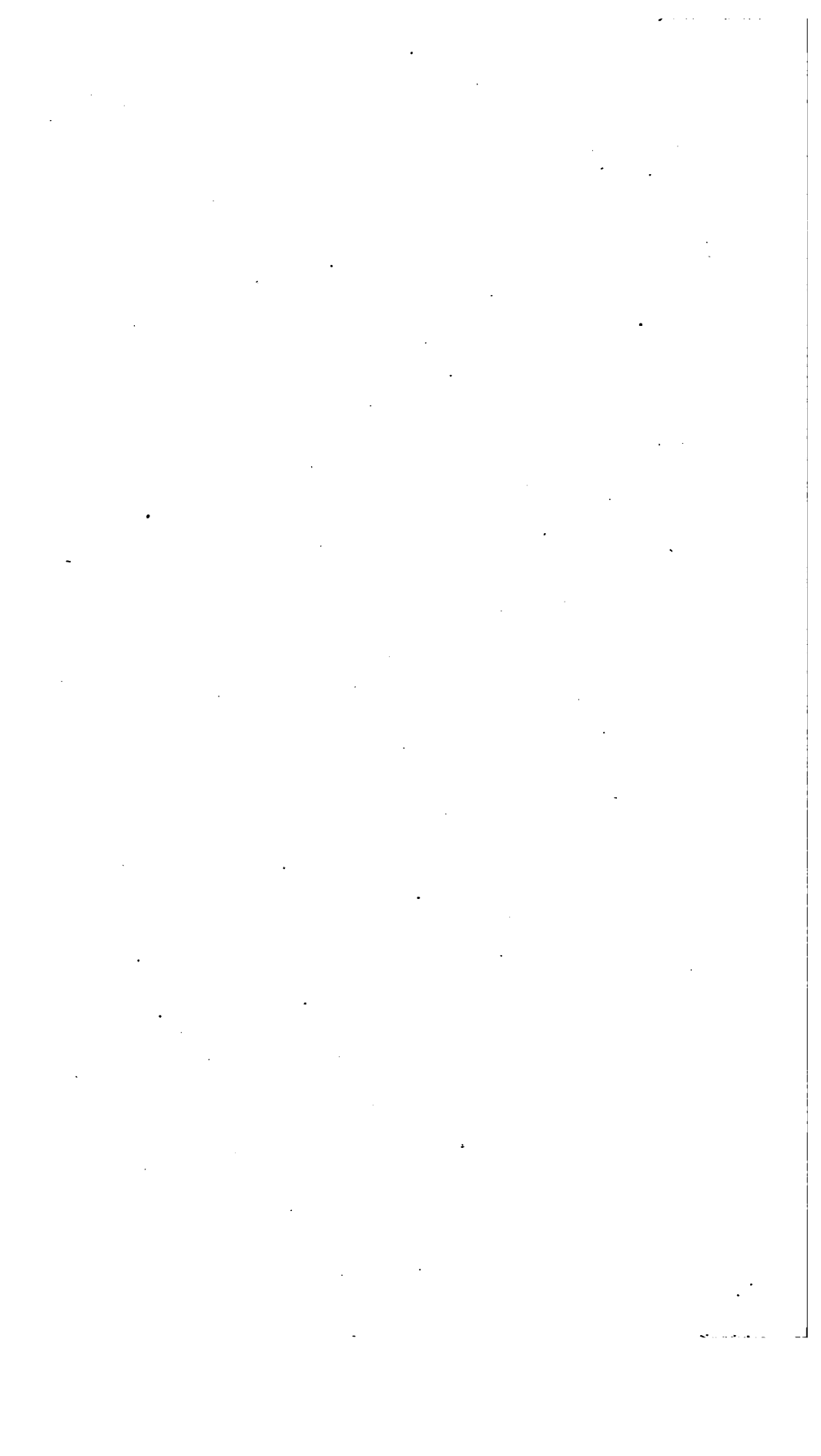
The election of trustees in 1921 resulted as follows:

Geo. W. Kinkead, first district; F. L. Kenoyer, third district; Albert Dickens, fifth district; James N. Farley, seventh district.

A. F. Baker was elected to fill the unexpired term of M. E. Chandler (resigned) in the second district.

Horticultural Statistics,
1920-1921.

(205)



HORTICULTURAL STATISTICS.

STATE SUMMARY.

HORTICULTURAL STATISTICS, 1920-1921.

FRUIT TREES.	1920.		1921.		1919.	1920.
	Bearing.	Nonbearing.	Bearing.	Nonbearing.	Bushels.	Bushels.
Apple.....	1,230,952	457,570	1,221,037	479,458	951,270	726,059
Pear.....	195,697	72,890	208,898	60,025	101,043	12,744
Peach.....	835,703	184,595	886,704	151,762	82,566	50,829
Plum.....	178,600	59,777	199,974	58,296	13,343	2,774
Cherry.....	415,251	172,939	419,842	163,264	73,405	19,684
Quince.....	4,840	2,841	8,107	3,117	.....	.....
Apricot.....	71,383	17,470	87,682	16,397	.....	.....
Totals	2,932,426	968,082	3,032,244	932,319	1,221,627	812,090

SMALL FRUITS.	Acres.		Crates.	
	1920.	1921.	1919.	1920.
Strawberries.....	679	971	57,291	45,065
Raspberries.....	749	711	31,629	17,300
Blackberries.....	654	641	21,501	19,720
Gooseberries.....	146	110	9,107	1,960
Totals	2,228	2,433	119,528	84,045

	Acres.		8-pound baskets.	
	1920.	1921.	1919.	1920.
Grapes.....	2,190	2,016	303,607	215,475

GARDENS.	Acres.		Estimated value.	
	1920.	1921.	1920.	1921.
Commercial gardens.....	5,837	7,512	\$729,625	\$1,051,680
Home gardens.....	13,470	11,075	1,683,750	1,550,500
Totals	19,307	18,587	\$2,413,375	\$2,602,180

	1919.	1920.
	1919.	1920.
Estimated value all fruit products.....	\$2,394,860	\$1,721,455

FORESTRY STATISTICS.

STREET TREES.	1920.	1921.
	Number, 413,038	Number, 398,985
Wild timber.....	Acres. 362,548	Acres. 344,358
Walnut.....	4,082	4,428
Locust.....	7,035	11,141
Cottonwood.....	13,479	14,279
Catalpa.....	10,033	9,935
Other varieties.....	38,347	30,975
Totals	435,524	415,116

FRUIT TREES OF BEARING AGE, 1920.

COUNTIES.	Apple.	Pear.	Peach.	Plum.	Cherry.	Quince.	Aprioot.
The State	1,230,952	195,809	835,703	178,600	415,251	4,840	71,383
Allen	11,262	2,980	12,198	2,048	3,702	133	158
Anderson	13,217	2,595	11,622	2,102	4,171	84	245
Atchison	35,785	4,185	8,339	3,384	8,283	56	150
Barber	8,535	851	8,680	1,127	2,054	6	1,321
Barton	8,331	1,032	1,621	453	1,409	6	295
Bourbon	34,059	1,684	12,334	2,970	2,867	68	40
Brown	15,284	2,519	10,111	2,214	5,139	19	377
Butler	9,974	1,500	9,004	1,396	2,222	41	875
Chase	5,848	1,790	5,585	680	1,662	20	160
Chautauqua	6,605	2,224	11,934	2,172	2,075	42	424
Cherokee	15,259	2,510	22,441	3,066	6,882	139	99
Cheyenne	997	168	1,079	1,939	3,332	1	81
Clark	672	86	917	108	491	6	124
Clay	6,647	1,792	8,422	1,398	4,195	37	721
Cloud	3,972	869	4,254	1,036	1,987	142	546
Coffey	11,963	2,152	8,663	2,651	2,845	120	249
Comanche	2,087	364	1,721	187	844	.....	254
Cowley	23,457	6,392	30,469	2,765	7,524	59	1,620
Crawford	4,671	1,005	7,486	2,637	1,923	45	64
Decatur	2,539	205	2,390	1,390	2,943	2	239
Dickinson	9,081	3,114	14,983	2,418	9,208	66	2,974
Doniphan	95,497	6,031	6,851	2,587	5,775	31	249
Douglas	25,941	7,261	13,781	2,945	7,638	220	422
Edwards	2,569	821	3,305	1,134	1,046	32	111
Elk	5,847	4,267	14,484	2,458	2,330	60	189
Ellis	531	120	146	253	350	.....	38
Ellsworth	4,730	1,060	4,188	664	2,031	21	455
Finnney	1,031	196	1,421	772	1,277	5	162
Ford	758	162	2,157	308	1,664	4	322
Franklin	24,363	2,970	15,339	3,285	4,526	180	377
Geary	3,224	712	2,424	234	1,642	7	132
Gove	299	83	515	2,337	1,282	.....	139
Graham	1,178	195	2,361	431	1,699	2	286
Grant	73	.....	245	417	295	.....	18
Gray	33	8	63	165	96	.....	.....
Greeley	5	3	117	53	146	.....	3
Greenwood	7,569	2,204	9,765	1,507	3,194	71	248
Hamilton	294	19	279	1,558	372	1	170
Harper	11,587	3,256	11,649	1,803	2,531	43	1,252
Harvey	13,558	2,931	11,070	2,380	5,046	99	2,858
Haskell . . . . .	.....	.....	.....	.....	.....	.....	.....
Hodgeman	84	82	133	68	124	.....	52
Jackson	26,950	4,223	11,180	3,391	8,616	79	462
Jefferson	39,623	5,985	12,405	3,414	8,179	53	340
Jewell	13,621	1,961	12,306	1,841	8,765	40	4,809
Johnson	18,258	2,734	10,023	2,742	8,169	104	142
Kearny	2,105	84	1,602	3,309	845	1	328
Kingman	14,537	2,069	15,975	1,329	2,708	102	1,836
Kiowa	874	437	5,133	365	2,103	.....	256
Labette	11,021	4,077	31,526	5,195	7,048	217	377
Lane	900	39	95	1,040	101	.....	4
Leavenworth	68,372	3,449	7,348	2,720	7,035	78	140
Lincoln	4,786	985	5,273	630	2,487	36	1,606
Linn	8,959	1,819	8,754	3,215	3,174	59	271
Logan	519	121	383	272	784	2	273
Lyon	15,668	3,341	8,724	1,473	3,237	164	514
Marion	7,657	2,543	10,049	1,794	6,398	101	5,019
Marshall	11,331	2,891	8,207	1,737	8,484	27	418
McPherson	12,189	2,708	10,876	2,300	6,739	59	6,307
Meade	2,034	491	4,236	533	2,404	62	722

FRUIT TREES OF BEARING AGE, 1920—CONCLUDED.

COUNTIES.	Apple.	Pear.	Peach.	Plum.	Cherry.	Quince.	Apicot.
Miami.....	22,145	3,173	15,819	3,736	7,906	99	234
Mitchell.....	3,124	592	2,972	648	1,709	18	435
Montgomery.....	7,839	6,688	24,937	4,079	5,079	143	382
Morris.....	12,640	1,871	6,098	731	2,909	24	406
Morton.....	124	15	347	150	84	2	5
Nemaha.....	24,603	3,342	11,883	2,760	8,139	38	1,363
Neosho.....	8,474	2,923	31,072	4,017	4,775	95	225
Ness.....	742	164	649	510	728	1	183
Norton.....	3,348	444	3,983	1,395	4,161	9	1,817
Ossage.....	12,089	2,547	8,836	1,640	3,657	167	543
Osborne.....	6,824	1,788	6,742	909	3,635	4	905
Ottawa.....	5,984	1,420	8,639	1,255	3,255	14	616
Pawnee.....	3,782	459	1,760	308	1,005	.....	136
Phillips.....	7,448	752	4,221	1,963	4,672	18	2,496
Pottawatomie.....	11,276	2,263	8,340	1,691	5,064	59	272
Pratt.....	4,978	857	9,581	2,135	3,618	13	1,262
Rawlins.....	2,354	268	2,037	569	3,613	9	129
Reno.....	94,539	5,668	25,733	2,181	10,618	52	5,461
Republic.....	12,494	2,105	9,318	1,266	5,638	8	1,002
Rice.....	14,324	1,745	9,004	1,010	4,466	39	1,126
Riley.....	6,003	1,441	5,002	1,244	3,460	15	279
Rooks.....	5,391	462	2,611	1,597	2,526	17	152
Rush.....	1,156	426	473	241	808	1	209
Russell.....	2,580	795	2,923	559	2,254	14	388
Saline.....	6,089	2,031	12,710	1,805	5,045	166	849
Scott.....	282	11	605	1,222	397	.....	101
Sedgwick.....	45,339	3,695	16,710	3,156	14,756	21	1,522
Seward.....	127	30	1,261	111	310	4	81
Shawnee.....	36,656	6,483	13,701	2,908	17,111	68	270
Sheridan.....	856	182	531	437	987	1	41
Sherman.....	1,229	230	1,085	6,576	3,196	8	153
Smith.....	.....	.....	.....	.....	.....	.....	.....
Stafford.....	19,879	2,990	13,790	2,419	6,131	46	1,357
Stanton.....	20	14	465	261	182	.....	18
Stevens.....	456	38	3,514	236	668	.....	262
Sumner.....	38,952	3,432	42,816	2,147	7,317	91	1,512
Thomas.....	119	47	125	730	929	.....	57
Trego.....	526	200	854	698	1,031	24	106
Wabaunsee.....	10,780	2,894	5,949	1,584	4,169	41	1,064
Wallace.....	277	23	562	1,020	367	.....	138
Washington.....	10,129	3,175	11,177	1,900	6,270	45	685
Wichita.....	43	13	488	100	154	.....	50
Wilson.....	10,770	2,089	15,167	2,176	3,190	91	330
Woodson.....	5,037	1,581	6,402	1,451	2,637	93	145
Wyandotte.....	80,305	11,981	26,170	9,389	40,527	230	293

FRUIT TREES NOT OF BEARING AGE, 1920.

COUNTIES.	Apple.	Pear.	Peach.	Plum.	Cherry.	Quince.	Apricot.
The State	457,570	72,890	184,595	59,777	172,939	2,841	17,470
Allen	5,054	2,866	2,846	915	2,334	33	88
Anderson	2,917	664	1,784	934	2,823	21	72
Atchison	8,704	1,661	2,192	943	2,784	20	83
Barber	1,070	227	2,019	218	744	.....	311
Barton	1,090	355	450	233	322	13	53
Bourbon	4,489	388	1,698	526	1,106	22	33
Brown	9,439	1,768	3,252	892	2,665	36	168
Butler	1,311	314	1,399	375	779	78	230
Chase	1,236	261	1,153	237	667	28	44
Chautauqua	2,767	528	2,391	499	1,195	13	135
Cherokee	3,898	636	2,878	1,027	3,391	63	42
Cheyenne	341	90	121	537	802	4	23
Clark	96	38	3,761	59	130	.....	37
Clay	3,678	909	2,094	632	1,757	23	205
Cloud	1,158	332	626	253	684	32	192
Coffey	7,010	1,904	3,841	1,841	3,561	58	323
Comanche	405	174	379	54	200	20	51
Cowley	29,714	2,263	4,898	957	2,067	67	348
Crawford	3,013	470	1,967	1,237	1,804	17	21
Decatur	322	154	504	254	765	.....	30
Dickinson	5,682	1,365	4,279	1,227	4,153	40	671
Doniphan	94,033	1,590	2,088	721	2,139	37	80
Douglas	12,894	5,105	3,763	1,278	3,487	73	223
Edwards	479	113	1,050	102	466	.....	44
Elk	2,353	307	2,079	408	1,147	6	92
Ellis	98	6	42	115	80	4	2
Ellsworth	1,288	391	1,406	239	749	5	166
Finney	302	124	242	246	468	2	27
Ford	45	37	220	68	331	13	88
Franklin	6,904	848	4,161	1,563	3,638	121	227
Geary	943	219	547	153	379	.....	49
Gove	239	69	124	251	262	.....	4
Graham	125	15	151	103	318	.....	.....
Grant	63	23	581	260	317	.....	163
Gray	25	19	25	25	36	.....	6
Greeley	17	.....	88	28	105	.....	.....
Greenwood	3,466	663	2,686	549	1,769	25	78
Hamilton	133	23	190	669	238	.....	16
Harper	2,877	583	3,185	689	1,600	19	340
Harvey	3,908	1,069	3,962	1,663	3,713	51	836
Haskell . . . . .	.....	.....	.....	.....	.....	.....	.....
Hodgeman	46	40	67	19	44	.....	57
Jackson	9,478	1,433	2,563	904	2,551	20	184
Jefferson	10,319	2,391	2,244	939	2,930	18	136
Jewell	1,980	549	1,175	480	1,830	21	429
Johnson	4,717	970	2,637	1,196	3,591	10	99
Kearny	44	6	244	115	23	.....	19
Kingman	2,699	513	1,891	506	1,480	34	322
Kiowa	217	83	969	100	766	.....	92
Labette	11,093	1,440	6,628	2,463	5,903	66	184
Lane	81	22	46	69	46	.....	10
Leavenworth	9,672	1,136	1,575	594	2,149	21	61
Lincoln	807	211	1,013	171	561	1	398
Linn	3,797	802	3,820	876	2,071	82	47
Logan	47	12	43	32	102	.....	6
Lyon	4,090	855	2,078	891	1,966	57	141
Marion	2,458	1,234	2,480	678	2,473	21	1,069
Marshall	8,570	2,154	3,046	1,113	4,173	43	232
McPherson	4,371	1,049	2,919	1,155	3,441	29	1,140
Meade	390	106	1,252	170	493	1	231

FRUIT TREES NOT OF BEARING AGE, 1920—CONCLUDED.

COUNTIES.	Apple.	Pear.	Peach.	Plum.	Cherry.	Quince.	Aprioot.
Miami.....	6,011	757	2,760	947	2,930	21	97
Mitchell.....	572	149	269	126	408	.....	56
Montgomery.....	3,871	1,234	4,809	1,333	3,009	165	175
Morris.....	2,568	601	1,296	279	1,218	15	123
Morton.....	54	7	40	61	75	.....	22
Nemaha.....	14,209	3,957	4,290	1,708	4,667	46	330
Nesho.....	6,241	1,338	5,256	1,597	5,169	34	74
Ness.....	146	83	248	107	174	.....	13
Norton.....	436	61	627	202	682	3	208
Ossage.....	5,957	1,403	3,359	1,021	2,514	81	269
Osborne.....	1,016	266	925	419	927	5	200
Ottawa.....	1,547	431	1,115	311	891	3	115
Pawnee.....	609	124	342	85	452	.....	2
Phillips.....	1,378	276	818	255	1,297	22	254
Pottawatomie.....	5,568	1,669	2,212	709	2,066	9	137
Pratt.....	491	186	1,439	97	906	6	274
Rawlins.....	1,589	156	659	269	898	12	52
Reno.....	10,890	920	4,093	1,247	3,731	76	1,038
Republic.....	3,454	1,117	1,615	626	2,072	28	293
Rice.....	2,398	484	2,156	482	1,715	37	298
Riley.....	4,406	692	1,241	447	2,140	10	118
Rooks.....	1,529	116	699	413	732	24	39
Rush.....	190	78	137	40	191	21	71
Russell.....	185	74	435	107	519	.....	28
Saline.....	3,025	790	2,594	625	1,386	8	322
Scott.....	59	11	33	50	86	.....	35
Sedgwick.....	5,799	960	5,480	1,231	5,169	49	597
Seward.....	37	29	663	52	441	3	45
Shawnee.....	9,629	1,621	2,371	965	6,813	21	100
Sheridan.....	28	14	50	32	138	.....	21
Sherman.....	159	34	72	220	515	10	19
Smith.....	.....	.....	.....	.....	.....	.....	.....
Stafford.....	1,627	582	1,599	272	1,440	10	188
Stanton.....	51	16	589	125	17	2	20
Stevens.....	1,257	46	529	155	206	6	35
Sumner.....	30,935	1,401	4,837	1,018	2,451	39	394
Thomas.....	58	15	71	166	321	.....	27
Trego.....	250	95	406	151	395	7	9
Wabaunsee.....	4,091	1,089	1,532	725	1,679	225	217
Wallace.....	125	8	258	296	137	1	24
Washington.....	4,993	1,477	3,086	667	2,610	46	275
Wichita.....	12	4	134	76	74	.....	55
Wilson.....	4,903	871	4,452	914	2,315	27	83
Woodson.....	3,930	665	2,238	591	1,595	22	80
Wyandotte.....	13,925	3,406	4,949	3,107	13,235	399	189

ACREAGE AND PRODUCTION OF SMALL FRUITS.

Acreage, 1920; production, 1919.

COUNTIES.	Strawberries.		Raspberries.		Blackberries.		Gooseberries.	
	Acres.	Crates.	Acres.	Crates.	Acres.	Crates.	Acres.	Crates.
The State.....	679	57,291	749	31,629	654	21,501	146	9,107
Allen.....	11	3,018	3	86	17	557	3	147
Anderson.....	5	90	3	51	5	19	6	25
Atchison.....	22	1,172	10	445	9	453	2	1
Barber.....				16	1	1	1	30
Barton.....		42					1	
Bourbon.....	6	856	3	533	6	232	3	107
Brown.....	16	2,876	5	136	2	168	1	221
Butler.....		245			1	8		20
Chase.....	2	25					1	2
Chautauqua.....	1	187		7	13	61	1	6
Cherokee.....	26	966	4	416	7	811	2	55
Cheyenne.....		421		44		3		70
Clark.....						1		
Clay.....	2	1,338	1				2	104
Cloud.....	3	6		3		5	1	
Coffey.....	8	253	6	12	5	309	3	171
Comanche.....								
Cowley.....	24	1,034	13	384	35	836	1	22
Crawford.....	2	155	2	52	2	139	1	91
Decatur.....		42						
Dickinson.....	7	155				1		42
Doniphan.....	93	4,105	210	10,962	153	6,644	4	864
Douglas.....	25	1,999	28	1,706	46	987	3	200
Edwards.....		4						
Elk.....	5	283	1	24	5	37	3	
Ellis.....		32						3
Ellsworth.....	3	30		5	1		1	47
Finney.....	1	325	3			10	3	36
Ford.....	1	1						
Franklin.....	32	1,378	22	840	14	787		14
Geary.....		16	1			1		
Gove.....	1	466		7				124
Graham.....	1	182						4
Grant.....		50						1
Gray.....								
Greeley.....								
Greenwood.....	3	150	5	155	3	25	3	82
Hamilton.....								9
Harper.....	2	61	1	22	1	120		11
Harvey.....	2	322	2	25	3	22	2	126
Haakell.....								
Hodgeman.....								
Jackson.....	39	1,473	15	169	1	35	2	95
Jefferson.....	21	3,331	8	153	8	168	5	77
Jewell.....	2	200				45		
Johnson.....	15	1,642	11	674	8	752	3	148
Kearny.....				2				
Kingman.....	8	156	2	537	7	176		160
Kiowa.....								4
Labette.....	30	1,068	11	76	16	229	4	76
Lane.....							1	
Leavenworth.....	47	1,221	21	585	25	45	1	171
Lincoln.....	1							
Linn.....	2	165		22	3	84	1	90
Logan.....								
Lyon.....	3	577	1	57	3	224	1	104
Marion.....	3	283		12	1	9	2	56
Marshall.....	8	440	2	30	3	23	3	208
McPherson.....	1	142	1	3	1	20	2	89
Meade.....	3	28		78		10		142

ACREAGE AND PRODUCTION OF SMALL FRUITS—CONCLUDED.

Acreage, 1920; production, 1919.

COUNTIES.	Strawberries.		Raspberries.		Blackberries.		Gooseberries.	
	Acres.	Crates.	Acres.	Crates.	Acres.	Crates.	Acres.	Crates.
Miami.....	6	369	6	81	6	61	2	37
Mitchell.....		25				4	1	5
Montgomery.....	8	1,155	6	79	17	563	1	10
Morris.....	1	20	1		2		2	269
Morton.....		2						3
Nemaha.....	14	1,941	2	58	2	34	1	14
Neosho.....	9	438	2	52	9	117	3	95
Ness.....								
Norton.....	3	1,785						95
Osage.....	3	168	2	39	2	28	6	49
Osborne.....		117		15				2
Ottawa.....	1	322		16	4	44	1	43
Pawnee.....		61		50				
Phillips.....		204						58
Pottawatomie.....	11	165	6	170	1		3	8
Pratt.....		125					1	15
Rawlins.....		12		200			1	66
Reno.....	2	334	2	18	11	430	3	39
Republic.....		208		10			1	11
Rice.....	1	122	1	12	2	53	1	83
Riley.....	5	160	4	93	1	35	1	10
Rooks.....		1				2	2	126
Rush.....								1
Russell.....		4						1
Saline.....		570	1			480		480
Scott.....		75						80
Sedgwick.....	2		2	112	4	211	3	205
Seward.....								
Shawnee.....	37	3,904	7	1,159	20	447	8	91
Sheridan.....								3
Sherman.....	1	989		22	1			183
Smith.....				7	3	162		25
Stafford.....	1	156						
Stanton.....		93						
Stevens.....		6				50		1
Sumner.....	1	160	7	37	7	37		
Thomas.....	2	25						2
Trego.....		310		24		12		
Wabaunsee.....	2	227	1	50	4	50	1	1
Wallace.....		25						9
Washington.....	2	163	2	32	1	11	2	95
Wichita.....								
Wilson.....	12	1,968	1	16	3	56	2	605
Woodson.....	6	1,149	2	5	5	71	2	4
Wyandotte.....	62	6,922	299	10,943	144	4,536	26	2,228

VINEYARDS, GARDENS, FRUITS, VEGETABLES.

Acreage, 1919.

COUNTIES.	Vine- yards, acres.	Eight pound baskets of grapes.	Commercial gardens.		Home gardens.		Value of fruit sold.
			Acres.	Value.	Acres.	Value.	
The State	2,190	303,607	5,837	\$729,625	13,470	\$1,683,750	\$2,394,860
Allen	23	3,574	31	\$3,875	58	\$7,250	\$16,018
Anderson	18	1,209	37	4,625	81	10,125	7,098
Atchison	35	6,454	28	3,500	184	23,000	87,868
Barber	11	932	36	4,500	42	5,250	16,698
Barton	1	27	34	4,250	112	14,000	2,959
Bourbon	11	3,384	25	3,125	157	19,625	19,177
Brown	36	2,680	20	2,500	99	12,375	32,235
Butler	7	777	20	2,500	146	18,250	4,235
Chase	5	369			76	9,500	6,898
Chautauqua	13	951	18	2,250	1,023	127,875	22,769
Cherokee	15	1,819	54	6,750	135	16,975	54,261
Cheyenne		1			1	125	7,069
Clark	4	85	3	375	2	250	1,678
Clay	10	475			118	14,750	12,859
Cloud	2	303	20	2,500	32	4,000	3,334
Coffey	22	3,476	6	750	224	28,000	10,818
Comanche	1	12			21	2,625	5,854
Cowley	24	1,345	120	15,000	1,229	153,625	51,293
Crawford	11	1,809			45	5,625	7,367
Decatur			3	375	25	3,125	11,839
Dickinson	22	315	6	750	301	37,625	10,082
Doniphan	257	21,001	39	4,875	58	7,250	333,725
Douglas	46	5,687	211	26,375	167	20,875	69,795
Edwards		80			15	1,875	7,672
Elk	10	75	11	1,375	170	21,250	3,639
Ellis			4	500	33	4,125	1,047
Ellsworth	3	34	8	1,000	140	17,500	4,072
Finney	5	786	25	3,125	1	125	7,564
Ford	1	16	30	3,750	139	17,375	1,006
Franklin	46	13,036	22	2,750	369	46,125	30,492
Geary	6	140	26	3,250	71	8,875	1,795
Gove	1	110			13	1,625	3,369
Graham					42	5,250	4,326
Grant		4					368
Gray							59
Greeley					3	375	97
Greenwood	18	1,352	13	1,625	84	10,500	7,899
Hamilton			1	125	12	1,500	898
Harper	12	541	2	250	88	11,000	14,428
Harvey	27	1,731	40	5,000	288	36,000	11,940
Haakell							
Hodgeman							
Jackson	40	2,379			239	29,875	31,505
Jefferson	60	5,006	51	6,375	311	38,875	84,735
Jewell	2	5			64	8,000	4,737
Johnson	40	5,106	135	16,875	183	22,875	28,045
Kearny							5,972
Kingman	27	2,708	9	1,125	96	12,000	21,195
Kiowa	2	18	1	125			3,700
Labette	23	1,427	79	9,875	164	20,500	67,971
Lane		10			11	1,375	175
Leavenworth	61	10,674			92	11,500	48,891
Lincoln	1	50	2	250	71	8,875	4,119
Linn	12	469	75	9,375	201	25,125	8,409
Logan			5	625	9	1,125	4,718
Lyon	38	1,295	63	7,875	194	24,250	13,850
Marion	29	948	7	875	200	25,000	7,493
Marshall	44	1,074			357	44,625	9,377
McPherson	19	201			147	18,375	16,733
Meade	1	559			56	7,000	7,535

VINEYARDS, GARDENS, FRUITS, VEGETABLES—CONCLUDED.

Acreage, 1919.

COUNTIES.	Vine- yards, acres.	Eight pound baskets of grapes.	Commercial gardens.		Home gardens.		Value of fruit sold.
			Acres.	Value.	Acres.	Value.	
Miami.....	21	2,037	7	875	235	29,375	17,303
Mitchell.....		72	82	10,250	85	10,625	2,295
Montgomery...	18	2,605	87	10,875	81	10,125	54,979
Morris.....	12	830			94	11,750	7,808
Morton.....	1	101			5	625	731
Nemaha.....	58	3,737			514	64,250	26,676
Neosho.....	25	1,146	100	12,500	350	43,750	23,145
Neos.....					27	3,375	1,892
Norton.....		27	12	1,500	33	4,125	17,318
Osage.....	34	903	21	2,625	236	29,500	7,984
Osborne.....	2	688			66	8,250	4,278
Ottawa.....	5	325			103	12,875	8,789
Pawnee.....	1	25	35	4,375	35	4,375	9,018
Phillips.....		100			75	9,375	13,576
Pottawatomie..	43	2,770	70	8,750	191	23,875	19,691
Pratt.....	5	345			58	7,250	11,567
Rawlins.....		10	5	625	33	4,125	4,440
Reno.....	47	4,760	718	89,750	147	18,375	165,380
Republic.....	9	101			298	37,250	6,353
Rice.....	7	1,245	21	2,625	70	8,750	8,712
Riley.....	15	5,816	207	25,875	95	11,875	15,104
Rooks.....		52	6	750	55	6,875	4,885
Rush.....	6				74	9,250	348
Russell.....		66					2,972
Saline.....	11	2,452	67	8,375	106	13,250	9,361
Scott.....	1	40	4	500	15	1,875	1,152
Sedgwick.....	33	913	251	31,375	218	27,250	99,342
Seward.....	1	75			325	40,625	2,260
Shawnee.....	97	14,651	973	121,625	127	15,875	58,432
Sheridan.....							3,221
Sherman.....		5	4	500			5,901
Smith.....							
Stafford.....	21	2,127	3	375	83	10,375	27,232
Stanton.....			8	1,000			420
Stevens.....		304	6	750			2,901
Sumner.....	17	1,329	160	20,000	127	15,875	145,858
Thomas.....					6	750	469
Trego.....		100	1	125			1,622
Wabaunsee.....	29	1,059	10	1,250	140	17,500	12,999
Wallace.....		12			23	2,875	2,897
Washington....	2	1,528			284	35,500	8,374
Wichita.....					4	500	1,395
Wilson.....	8	625			95	11,875	15,739
Woodson.....	12	202			259	32,375	7,304
Wyandotte....	547	143,905	1,659	207,375	499	62,375	286,982

FRUIT GROWN IN 1919.

COUNTIES.	Apples, bushels.	Pears, bushels.	Peaches, bushels.	Plums, bushels.	Cherries, bushels.
The State.....	951,270	101,043	82,566	13,343	73,405
Allen.....	2,317	734	1,484	167	625
Anderson.....	2,220	1,173	26	46	637
Atchison.....	52,680	1,874	8	433	1,750
Barber.....	6,895	479	1,754	103	386
Barton.....	1,531	371	64	3	88
Bourbon.....	2,852	320	2,030	126	214
Brown.....	11,926	1,109	.....	117	719
Butler.....	763	369	1	35	323
Chase.....	3,945	214	.....	21	516
Chautauqua.....	3,594	1,350	4,387	299	520
Cherokee.....	7,325	260	10,536	329	1,056
Cheyenne.....	280	18	788	241	992
Clark.....	705	22	162	.....	90
Clay.....	3,941	574	12	106	730
Cloud.....	1,604	157	3	17	380
Coffey.....	3,792	633	80	125	223
Comanche.....	2,077	147	846	10	224
Cowley.....	26,428	1,907	685	112	794
Crawford.....	249	180	1,337	131	102
Decatur.....	4,640	31	701	323	1,240
Dickinson.....	1,812	1,238	68	243	2,248
Doniphan.....	158,453	8,503	.....	67	1,761
Douglas.....	28,133	6,745	24	167	2,016
Edwards.....	2,276	151	1,400	8	75
Elk.....	332	619	511	79	52
Ellis.....	412	.....	10	105	39
Ellsworth.....	2,161	137	22	12	313
Finney.....	1,491	144	865	127	450
Ford.....	106	4	206	13	100
Franklin.....	9,084	1,281	83	408	1,042
Geary.....	596	253	.....	1	282
Gove.....	36	51	216	96	147
Graham.....	1,407	4	435	48	174
Grant.....	10	.....	48	.....	16
Gray.....	3	.....	15	.....	5
Greeley.....	2	2	25	4	4
Greenwood.....	851	578	749	18	809
Hamilton.....	214	51	110	45	34
Harper.....	4,872	911	1,653	102	237
Harvey.....	4,536	1,118	21	170	804
Haakell.....	.....	.....	.....	.....	.....
Hodgeman.....	.....	.....	.....	.....	.....
Jackson.....	16,354	2,800	20	183	1,881
Jefferson.....	43,014	18,689	17	279	1,865
Jewell.....	1,050	129	357	19	530
Johnson.....	7,049	539	9	318	1,339
Kearny.....	1,389	22	791	619	70
Kingman.....	8,909	759	678	64	332
Kiowa.....	232	41	956	13	190
Labette.....	4,059	2,371	16,644	487	1,301
Lane.....	.....	100	30	.....	.....
Leavenworth.....	24,221	2,384	40	47	675
Lincoln.....	2,406	241	59	25	152
Linn.....	3,010	481	313	204	502
Logan.....	3,203	30	66	15	58
Lyon.....	5,455	1,216	.....	20	469
Marion.....	768	353	.....	43	2,162
Marshall.....	3,394	638	.....	68	524
McPherson.....	9,835	459	51	155	657
Meade.....	976	50	1,069	192	615

FRUIT GROWN IN 1919—CONCLUDED.

COUNTIES.	Apples, bushels.	Pears, bushels.	Peaches, bushels.	Plums, bushels.	Cherries, bushels.
Miami.....	7,942	1,097	19	102	1,118
Mitchell.....	1,201	76	3	38	167
Montgomery.....	2,041	1,828	12,979	340	1,261
Morris.....	3,018	753	5	25	304
Morton.....	10	.....	214	9	.....
Nemaha.....	10,829	1,158	23	105	943
Neosho.....	1,565	862	5,041	109	807
Ness.....	781	14	173	90	52
Norton.....	4,105	29	449	450	1,364
Osage.....	3,858	518	.....	18	363
Osborne.....	1,544	456	124	57	190
Ottawa.....	3,849	775	14	99	338
Pawnee.....	5,064	167	360	27	178
Phillips.....	5,855	298	481	64	1,387
Pottawatomie.....	10,055	1,597	18	126	661
Pratt.....	3,693	223	1,150	61	1,050
Rawlins.....	936	33	650	34	429
Reno.....	111,725	3,315	663	224	1,549
Republic.....	3,268	258	72	9	268
Rice.....	3,873	817	1	102	411
Riley.....	5,711	547	.....	212	1,476
Rooks.....	1,510	105	247	244	479
Rush.....	116	54	19	7	24
Russell.....	921	140	332	49	198
Saline.....	1,337	1,043	.....	213	458
Scott.....	210	.....	63	45	21
Sedgwick.....	26,817	1,587	14	227	978
Seward.....	17	.....	721	3	21
Shawnee.....	15,425	2,318	24	147	3,813
Sheridan.....	1,161	27	90	8	161
Sherman.....	181	23	277	27	305
Smith.....	.....	.....	.....	.....	.....
Stafford.....	11,926	1,462	1,726	94	922
Stanton.....	.....	.....	19	8	9
Stevens.....	312	.....	612	53	141
Sumner.....	100,245	719	1,565	100	1,661
Thomas.....	.....	.....	26	10	138
Trego.....	45	5	41	27	41
Wabaunsee.....	6,191	1,299	12	9	672
Wallace.....	1,095	.....	287	73	129
Washington.....	3,145	914	3	78	595
Wichita.....	8	9	434	5	30
Wilson.....	556	305	1,041	463	657
Woodson.....	1,159	249	69	88	295
Wyandotte.....	96,105	15,949	10	1,946	11,802

FORESTRY STATISTICS, 1920.

COUNTIES.	Street trees.	Wild timber.	Walnut	Locust.	Cotton-wood.	Catalpa.	Other varieties.
	Number.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
The State.....	413,038	362,548	4,082	7,035	13,479	10,033	38,347
Allen.....	6,908	2,743	40	13	64	12	641
Anderson.....	2,902	32,171	30		13	186	1,370
Atchison.....	6,499	7,218	112	6	8		4,310
Barber.....	5,332	3,399	114	65	71	79	577
Barton.....	1,178	3,270	10	134	249	119	41
Bourbon.....	3,457	5,189	9			15	
Brown.....	3,991	3,283	19	5	10	108	
Butler.....	3,188	4,412	1	20		16	24
Chase.....	1,160	3,887	1	1	1	21	19
Chautauqua.....	714	8,942	17	1		416	908
Cherokee.....	798	3,055	12		1	72	785
Cheyenne.....	1,046	239	13	5	5	3	121
Clark.....		1		3		4	
Clay.....	1,612	3,811	33	2	93	16	779
Cloud.....	1,544	2,904	11		12	7	31
Coffey.....	1,078	3,731	11		3	45	295
Comanche.....	10	964	5	339	284	94	283
Cowley.....	4,298	6,564	26	43	26	430	607
Crawford.....	421	848	2			389	
Decatur.....	149	1,309	5	10	24		130
Dickinson.....	10,921	3,893	239	1	18	6	74
Doniphan.....		5,233	24			1	
Douglas.....	15,839	12,105	63	1		8	45
Edwards.....	2,210		2	401	283	54	14
Elk.....	1,491	4,104	2				180
Ellis.....	4,483	769	26	12	11	6	100
Ellsworth.....	6,114	3,912	14	916	297	53	141
Finney.....	1,626	9		24	80	105	79
Ford.....	2,084	122		85	770	77	55
Franklin.....	4,110	6,334	175			34	
Geary.....		2,958	5				
Gove.....	213	22	6	2	3	9	962
Graham.....	457	704	7	40	99	6	135
Grant.....	12	1		4	4	1	
Gray.....	367			2	38	1	
Greeley.....					1		
Greenwood.....	590	5,638	147	15	7	424	125
Hamilton.....	20	85	3	7	31		7
Harper.....	6,442	374	8	329	411	406	451
Harvey.....	10,043	850	88	26	240	123	170
Haakell.....							
Hodgeman.....				24			88
Jackson.....	8,289	8,442	1			20	5
Jefferson.....	1,148	17,040	28	2	6	9	1
Jewell.....	3,037	7,056	24	8	113	13	155
Johnson.....	2,956	2,138	305	25	78	1	53
Kearny.....	5,127		10	3	36	2	59
Kingman.....	1,602	198	58	197	494	461	388
Kiowa.....	469	59		1			60
Labette.....	4,110	5,442	295	113	5	9	874
Lane.....		69	16	87	117		
Leavenworth.....	1,158	11,794	3				5
Lincoln.....	1,343	2,568	12	119	474	8	45
Linn.....	1,870	10,333		2			111
Logan.....	4,102	53		52	25		6
Lyon.....	18,145	5,326				67	135
Marion.....	21,635	1,779	52	186	42	29	90
Marshall.....	3,875	11,819	8		25	51	59
McPherson.....	22,185	3,343	54	14	388	53	348
Meade.....	1,866	170	4	95	80	29	56

FORESTRY STATISTICS, 1920—CONCLUDED.

COUNTIES.	Street trees.	Wild timber.	Walnut	Locust.	Cotton- wood.	Catalpa.	Other varieties.
	Number.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Miami.....	771	7,427	5			8	
Mitchell.....	7,589	1,201	2	2	72	192	446
Montgomery.....	618	3,871	20	2		19	1
Morris.....	6,350	4,906	240	2	6	5	33
Morton.....	35		2	10	1	5	1
Nemaha.....	5,425	12,575	1	1	11	15	55
Neosho.....	4,315	5,479	12	29		113	1,207
Ness.....	1,516	287	16	75	64	100	512
Norton.....	2,640	2,080		64	1		182
Osage.....	7,364	4,370	98	2		70	563
Osborne.....	5,491	4,281	24	60	48	11	86
Ottawa.....	2,288	2,794	15		94	15	98
Pawnee.....	12,801	406	8	98	1,027	50	204
Phillips.....	1,989	3,631	12	12	11		22
Pottawatomie.....	1,633	14,301				28	69
Pratt.....	119	152	1	243	52	74	5,233
Rawlins.....	4,489	986	2	33	5		14
Reno.....	19,356	603	71	138	1,168	1,635	1,039
Republic.....	1,259	5,469	9	6	767	38	338
Rice.....	18,394	560	10	270	467	140	385
Riley.....		4,840	9	1	19	5	20
Rooks.....	3,578	1,186	18	86	164		188
Rush.....	796	823		164	28		11
Russell.....	6,147	1,169	2	17	58	1	33
Saline.....	10,261	1,556		11	67	10	36
Scott.....	1,449				2	1	1
Sedgwick.....	23,191	1,407	54	30	299	72	49
Seward.....	805			33	46		1
Shawnee.....	2,164	2,887	13	110	5	19	6,584
Sheridan.....	1,048	129	23	24	175	1	88
Sherman.....	4,090	9	1	17	41		54
Smith.....							
Stafford.....	3,988	110	61	431	1,479	768	653
Stanton.....			1	5	10		1
Stevens.....	4,025			1	7	21	1
Sumner.....	4,319	2,894	754	861	214	1,828	597
Thomas.....	2,531	3		33	12	1	21
Trego.....	1,228	102	74	596	1,551	14	2,225
Wabaunsee.....	2,785	8,833	9		10	16	1
Wallace.....	50	42	12	7	340		2
Washington.....	4,763	9,001	44	4	35	109	193
Wichita.....	718			1	5	1	
Wilson.....	996	7,025	175	93			5
Woodson.....	3,884	8,498				2	61
Wyandotte.....	8,967	4,023	134	23	79	548	1,036

FRUIT TREES OF BEARING AGE, 1921.

COUNTIES.	Apple.	Pear.	Peach.	Plum.	Cherry.	Quince.	Apricot.
The State.....	1,221,037	208,898	886,704	199,974	419,842	8,107	87,682
Allen.....	11,412	3,160	13,576	3,015	4,078	159	249
Anderson.....	10,004	2,268	11,121	2,197	3,947	101	234
Atchison.....	32,075	3,621	8,635	2,998	7,568	26	166
Barber.....	9,648	1,096	9,790	1,495	1,974	7	1,527
Barton.....	7,887	1,168	2,266	650	1,703	36	390
Bourbon.....	35,557	2,218	9,916	2,081	2,511	16	50
Brown.....	18,088	3,330	12,643	3,010	5,987	22	542
Butler.....	5,189	1,342	9,396	1,012	1,944	81	1,007
Chase.....	5,848	1,181	6,775	890	1,761	23	288
Chautauqua.....	7,909	2,825	12,047	8,217	2,498	51	768
Cherokee.....	12,392	2,100	19,492	3,289	5,518	197	46
Cheyenne.....	1,332	192	1,215	2,766	3,208	.....	128
Clark.....	721	207	1,956	221	925	8	339
Clay.....	6,337	1,958	10,332	1,102	4,603	19	903
Cloud.....	4,282	1,257	3,912	932	2,603	11	1,457
Coffey.....	9,332	2,290	9,687	2,283	2,906	64	421
Comanche.....	1,970	533	2,615	259	872	4	400
Cowley.....	48,636	8,022	35,312	3,467	7,631	92	1,846
Crawford.....	4,868	1,115	6,592	1,617	1,659	29	50
Decatur.....	2,799	362	1,841	1,317	4,013	2	254
Dickinson.....	10,378	3,102	17,837	2,027	8,369	78	3,215
Doniphan.....	98,314	6,739	8,426	2,436	5,529	50	281
Douglas.....	24,440	9,802	16,381	3,383	10,024	223	473
Edwards.....	2,345	541	5,676	657	1,305	8	142
Elk.....	5,308	3,618	14,073	1,896	2,000	39	222
Ellis.....	584	93	239	259	406	.....	43
Ellsworth.....	4,111	1,183	5,075	733	1,805	17	559
Finney.....	1,085	182	1,302	618	1,230	3	138
Ford.....	817	408	2,873	424	2,515	14	654
Franklin.....	17,248	3,333	20,415	3,443	5,960	160	443
Geary.....	2,797	663	3,101	327	1,674	14	215
Gove.....	376	150	801	2,828	918	.....	127
Graham.....	1,370	202	3,208	516	1,500	3	399
Grant.....	34	1	221	1,324	234	.....	57
Gray.....	188	42	246	142	253	.....	79
Greeley.....	70	5	374	584	765	.....	31
Greenwood.....	8,306	2,113	11,935	2,151	3,607	42	361
Hamilton.....	388	34	364	1,966	440	1	127
Harper.....	11,618	1,871	12,850	1,413	2,384	52	1,405
Harvey.....	10,459	2,512	11,442	2,040	4,608	92	2,891
Haskell.....	.....	.....	.....	.....	.....	.....	.....
Hodgeman.....	45	33	62	67	118	2	9
Jackson.....	25,203	4,141	13,330	3,420	8,625	38	650
Jefferson.....	38,321	6,085	15,082	3,183	8,039	77	494
Jewell.....	22,821	2,031	12,719	1,877	9,388	28	3,296
Johnson.....	15,232	3,611	12,618	8,499	7,482	103	245
Kearny.....	1,540	59	1,228	962	526	.....	357
Kingman.....	13,081	2,448	18,351	1,366	2,961	70	2,398
Kiowa.....	1,096	405	4,465	438	1,853	1	315
Labette.....	14,217	4,773	31,780	5,856	8,120	214	505
Lane.....	953	83	107	228	273	3	42
Leavenworth.....	59,046	4,318	7,976	2,748	4,395	76	184
Lincoln.....	4,708	1,258	6,435	728	2,481	22	1,829
Linn.....	13,113	1,455	10,470	2,437	2,542	35	128
Logan.....	606	120	455	389	784	.....	295
Lyon.....	11,368	2,996	9,832	1,327	3,068	89	514
Marion.....	7,054	2,965	12,163	1,499	5,716	73	5,212
Marshall.....	11,141	2,924	9,057	1,841	7,829	17	485
McPherson.....	12,740	2,873	13,093	2,480	6,674	34	6,993
Meade.....	1,665	385	4,321	8,310	2,691	24	719

FRUIT TREES OF BEARING AGE, 1921—CONCLUDED.

COUNTIES.	Apple.	Pear.	Peach.	Plum.	Cherry.	Quince.	Apricot.
Miami.....	18,696	2,783	17,215	3,064	7,177	119	249
Mitchell.....	3,536	688	4,129	981	2,317	9	879
Montgomery.....	7,598	6,125	21,835	3,349	5,201	205	479
Morris.....	9,230	2,026	7,452	642	2,685	29	630
Morton.....	20	12	419	347	83	.....	21
Nemaha.....	21,445	4,487	14,705	3,082	7,892	30	1,067
Neosho.....	9,261	3,256	13,257	3,607	3,703	113	211
Ness.....	728	137	560	1,358	713	.....	203
Norton.....	3,177	361	4,028	971	3,494	33	1,417
Osage.....	11,245	3,097	12,796	2,547	4,626	182	731
Osborne.....	6,892	1,901	4,758	2,278	3,388	178	930
Ottawa.....	5,391	1,532	10,335	1,415	3,189	10	1,177
Pawnee.....	4,387	830	2,248	478	1,576	6	51
Phillips.....	7,621	768	4,171	2,071	5,132	45	2,908
Pottawatomie.....	10,736	2,445	9,431	1,667	4,822	35	388
Pratt.....	5,451	1,114	10,687	5,213	4,017	7	2,125
Rawlins.....	1,997	223	2,353	688	3,378	5	201
Reno.....	76,641	5,841	31,901	2,659	10,323	123	6,667
Republic.....	7,961	1,767	6,326	924	4,359	2	994
Rice.....	14,696	1,834	10,087	1,290	4,886	72	1,584
Riley.....	6,237	1,655	6,002	1,318	3,705	16	382
Rooks.....	4,763	710	3,319	1,814	2,782	1	153
Rush.....	948	378	669	978	925	1	468
Russell.....	2,020	586	1,797	383	1,684	15	288
Saline.....	5,344	1,874	12,625	1,691	4,469	33	928
Scott.....	296	39	358	1,355	481	.....	130
Sedgwick.....	46,168	4,361	18,314	2,941	9,875	46	2,114
Seward.....	153	79	1,190	104	421	12	75
Shawnee.....	40,336	8,902	17,895	4,705	22,137	307	493
Sheridan.....	758	98	494	381	967	.....	64
Sherman.....	12,279	173	961	5,180	2,930	3	182
Smith.....	8,117	611	5,644	905	6,589	25	3,778
Stafford.....	18,451	3,915	16,118	2,902	6,267	24	2,847
Stanton.....	67	24	787	381	205	1	31
Stevens.....	396	29	2,029	361	829	.....	175
Sumner.....	51,284	2,379	17,929	1,960	8,139	35	1,481
Thomas.....	117	23	166	186	678	2	25
Trego.....	440	246	648	855	838	3	162
Wabauaunsee.....	9,769	3,513	8,330	1,687	4,240	62	1,346
Wallace.....	344	36	296	1,035	290	1	95
Washington.....	11,019	3,347	12,794	1,703	6,870	44	969
Wichita.....	91	30	797	288	607	.....	195
Wilson.....	9,217	1,713	13,482	2,356	3,495	333	213
Woodson.....	5,596	1,359	7,064	1,480	2,248	91	233
Wyandotte.....	69,669	11,989	38,801	9,804	38,210	3,199	345

FRUIT TREES NOT OF BEARING AGE, 1921.

COUNTIES.	Apple.	Pear.	Peach.	Plum.	Cherry.	Quince.	Aprioot.
The State	479,458	60,025	151,762	58,296	163,264	3,117	16,397
Allen	4,726	706	2,794	724	2,049	36	85
Anderson	2,392	596	1,491	825	2,421	9	80
Atchison	9,009	1,534	1,739	993	2,273	85	60
Barber	834	529	967	258	909	.....	185
Barton	802	174	648	91	345	.....	58
Bourbon	3,547	358	1,432	508	1,469	7	16
Brown	12,021	1,833	3,951	1,374	3,065	17	240
Butler	773	162	1,291	165	532	9	80
Chase	1,583	266	680	270	700	20	40
Chautauqua	2,477	424	1,886	600	1,129	16	91
Cherokee	3,661	489	3,221	1,020	3,396	21	22
Cheyenne	389	153	446	873	1,198	2	58
Clark	142	75	584	86	326	3	68
Clay	2,694	794	1,267	421	1,796	15	143
Cloud	1,001	212	609	276	880	15	218
Coffey	6,185	1,605	2,943	1,277	3,654	33	214
Comanche	117	52	62	13	34	.....	7
Cowley	43,850	594	3,210	944	2,068	19	380
Crawford	2,378	520	2,165	1,214	1,562	22	31
Decatur	572	113	427	182	826	11	40
Dickinson	2,626	821	1,544	575	2,272	35	410
Doniphan	127,901	1,380	2,303	597	1,883	97	70
Douglas	11,802	5,482	3,573	1,628	4,441	72	217
Edwards	209	119	540	48	425	8	1
Elk	1,868	249	1,852	403	1,028	8	42
Ellis	183	20	50	84	134	.....	2
Ellsworth	814	294	878	211	644	6	147
Finney	234	72	842	1,471	694	18	31
Ford	168	90	994	145	590	3	168
Franklin	6,369	1,057	2,468	1,494	2,985	98	166
Geary	846	218	396	152	509	1	64
Gove	126	50	362	687	420	19	11
Graham	96	44	805	50	521	.....	17
Grant	60	12	74	90	117	.....	44
Gray	22	11	33	2	34	.....	20
Greeley	9	.....	34	462	88	.....	.....
Greenwood	3,438	635	2,220	477	1,850	18	84
Hamilton	122	40	1,259	236	280	4	26
Harper	1,183	295	2,276	337	1,267	9	305
Harvey	2,070	523	1,753	742	1,887	41	466
Haskell . . . . .	.....	.....	.....	.....	.....	.....	.....
Hodgeman	6	2	.....	4	.....	.....	.....
Jackson	8,548	1,339	2,317	822	2,570	33	123
Jefferson	9,923	1,975	1,550	1,008	2,631	38	107
Jewell	1,672	496	1,396	490	1,852	14	417
Johnson	5,784	861	2,556	1,573	4,604	32	55
Kearny	46	.....	55	56	39	.....	6
Kingman	1,872	422	2,077	281	1,110	29	410
Kiowa	194	68	1,671	110	641	40	71
Labette	6,019	1,284	7,269	2,612	6,819	104	183
Lane	73	9	50	27	109	.....	6
Leavenworth	10,813	1,132	1,388	873	1,924	40	69
Lincoln	886	226	1,483	146	609	20	252
Linn	2,462	496	1,274	668	1,877	55	59
Logan	110	35	257	89	229	.....	40
Lyon	3,084	561	1,153	502	1,411	14	129
Marion	1,646	497	1,444	440	1,743	6	875
Marshall	7,374	1,953	2,019	975	3,544	38	172
McPherson	3,544	927	2,353	1,022	2,914	101	1,147
Meade	292	94	1,323	243	865	4	316

FRUIT TREES NOT OF BEARING AGE, 1921—CONCLUDED.

COUNTIES.	Apple.	Pear.	Peach.	Plum.	Cherry.	Quince.	Apricot.
Miami.....	4,494	615	2,052	897	2,428	25	110
Mitchell.....	656	136	334	200	461	1	57
Montgomery.....	2,773	733	3,564	819	3,568	545	148
Morris.....	1,795	357	841	172	989	40	111
Morton.....	52	9	164	180	375	.....	20
Nemaha.....	18,679	3,237	3,834	1,469	3,863	36	336
Neosho.....	3,054	513	2,669	809	1,295	5	48
Ness.....	316	72	181	73	209	.....	23
Norton.....	798	98	751	381	964	19	164
Osage.....	4,535	1,105	2,530	817	2,398	90	473
Osborne.....	1,079	359	1,009	283	824	9	173
Ottawa.....	1,903	459	1,017	295	1,020	.....	161
Pawnee.....	602	221	463	68	1,054	11	71
Phillips.....	1,582	337	563	404	1,765	35	156
Pottawatomie.....	5,060	1,738	1,632	810	1,716	9	105
Pratt.....	664	240	1,169	38	650	110	227
Rawlins.....	615	160	366	379	874	.....	41
Reno.....	7,880	702	3,789	1,010	3,916	15	1,225
Republic.....	2,375	719	1,609	386	1,416	2	257
Rice.....	1,816	527	1,596	650	1,743	28	271
Riley.....	3,433	463	782	320	1,145	4	80
Rooks.....	562	219	763	174	592	5	23
Rush.....	134	26	213	128	293	.....	27
Russell.....	147	52	382	42	435	.....	42
Saline.....	1,550	382	840	593	1,462	22	112
Scott.....	25	9	44	66	151	11	178
Sedgwick.....	6,876	589	5,176	901	5,723	13	565
Seward.....	39	27	536	105	448	40	10
Shawnee.....	10,322	1,815	1,884	933	5,176	41	113
Sheridan.....	128	59	90	68	291	.....	50
Sherman.....	82	51	137	301	223	.....	49
Smith.....	1,504	384	611	399	1,844	.....	613
Stafford.....	1,256	443	2,110	667	1,829	17	171
Stanton.....	40	5	360	158	286	8	89
Stevens.....	269	22	543	218	.....	.....	81
Sumner.....	37,496	497	4,955	653	3,109	31	274
Thomas.....	42	3	51	245	154	.....	7
Trego.....	203	132	512	509	664	2	182
Wabaunsee.....	3,891	1,148	1,432	823	1,862	41	109
Wallace.....	155	78	216	263	70	.....	17
Washington.....	4,517	1,308	1,762	740	2,361	21	247
Wichita.....	66	11	316	320	303	53	16
Wilson.....	5,069	781	3,984	867	2,255	46	98
Woodson.....	3,401	733	1,772	427	1,564	32	80
Wyandotte.....	13,876	3,473	4,484	4,290	11,284	416	144

ACREAGE AND PRODUCTION OF SMALL FRUITS, 1921.

COUNTIES.	Strawberries.		Raspberries.		Blackberries.		Gooseberries.	
	Acreage.	Crates.	Acreage.	Crates.	Acreage.	Crates.	Acreage.	Crates.
The State.....	971	45,065	711	17,300	641	19,720	110	1,960
Allen.....	16	707	6	120	10	919	2	33
Anderson.....	18	148	5	220	6	63	3	31
Atchison.....	16	2,389	10	912	5	1,116	1	.....
Barber.....	2	27	2	.....	2	3	2	8
Barton.....	.....	100	.....	.....	.....	.....	.....	16
Bourbon.....	8	82	2	27	8	111	1	.....
Brown.....	17	1,677	4	70	6	8	1	.....
Butler.....	1	3	.....	.....	1	.....	1	12
Chase.....	1	.....	.....	2	.....	2	1	.....
Chautauqua.....	3	12	4	244	9	210	1	266
Cherokee.....	21	220	2	26	4	206	2	.....
Cheyenne.....	1	55	.....	3	.....	.....	.....	12
Clark.....	.....	.....	.....	.....	.....	.....	.....	.....
Clay.....	3	765	.....	25	.....	.....	.....	50
Cloud.....	2	88	.....	4	.....	1	.....	.....
Coffey.....	11	1,614	13	18	9	39	2	4
Comanche.....	.....	.....	.....	.....	.....	.....	.....	.....
Cowley.....	18	217	11	91	18	1,122	1	3
Crawford.....	2	12	.....	24	1	127	.....	2
Decatur.....	1	12	.....	.....	1	.....	.....	.....
Dickinson.....	5	1,008	4	.....	1	9	.....	.....
Doniphan.....	168	7,841	261	4,388	139	6,348	3	10
Douglas.....	56	1,357	34	302	43	346	6	33
Edwards.....	1	5	.....	.....	.....	.....	.....	.....
Elk.....	7	76	3	20	9	76	2	1
Ellis.....	.....	24	.....	.....	.....	.....	.....	1
Ellsworth.....	.....	50	.....	8	.....	.....	.....	22
Finnery.....	.....	5	.....	150	.....	.....	.....	8
Ford.....	.....	50	.....	.....	.....	.....	.....	3
Franklin.....	30	1,216	16	226	14	380	13	64
Geary.....	1	.....	.....	.....	1	.....	.....	.....
Gove.....	.....	.....	.....	.....	.....	.....	.....	.....
Graham.....	.....	165	.....	.....	.....	.....	.....	.....
Grant.....	.....	.....	.....	.....	.....	.....	.....	1
Gray.....	.....	.....	.....	.....	.....	.....	.....	.....
Greeley.....	.....	.....	.....	.....	.....	.....	.....	.....
Greenwood.....	3	406	.....	25	3	3	2	4
Hamilton.....	.....	.....	.....	.....	.....	.....	.....	5
Harper.....	.....	20	.....	.....	.....	6	.....	.....
Harvey.....	3	198	1	20	1	20	.....	20
Haskell.....	.....	.....	.....	.....	.....	.....	.....	.....
Hodgeman.....	.....	.....	.....	.....	.....	.....	.....	.....
Jackson.....	87	1,258	7	170	7	13	2	26
Jefferson.....	40	1,466	16	93	8	76	1	56
Jewell.....	1	.....	.....	.....	.....	.....	.....	1
Johnson.....	38	1,078	29	512	15	570	3	.....
Kearny.....	.....	.....	.....	.....	.....	75	.....	.....
Kingman.....	1	28	2	33	4	41	.....	73
Kiowa.....	.....	15	.....	.....	.....	.....	.....	.....
Labette.....	9	593	9	29	11	159	2	39
Lane.....	1	115	.....	.....	.....	.....	.....	.....
Leavenworth.....	35	1,526	26	218	23	274	1	9
Lincoln.....	.....	4	.....	.....	.....	.....	.....	70
Linn.....	4	156	2	68	2	143	1	120
Logan.....	1	14	.....	.....	.....	.....	1	.....
Lyon.....	7	226	6	77	4	80	1	.....
Marion.....	1	158	.....	4	.....	2	1	6
Marshall.....	9	214	1	273	3	12	2	30
McPherson.....	1	25	.....	4	.....	1	2	2
Meade.....	4	255	.....	30	.....	1	.....	.....

ACREAGE AND PRODUCTION OF SMALL FRUITS, 1921—CONCLUDED.

COUNTIES.	Strawberries.		Raspberries.		Blackberries.		Gooseberries.	
	Acreage.	Crates.	Acreage.	Crates.	Acreage.	Crates.	Acreage.	Crates.
Miami.....	9	149	6	64	45	106	1	
Mitchell.....	2	150				4		
Montgomery.....	20	2,268	5	35	14	737	1	
Morris.....	9				2		3	
Morton.....						4		
Nemaha.....	18	2,259	7	15	2	12	4	1
Neosho.....	18	880	2		9	200	3	
Ness.....								
Norton.....	1	108						36
Oaage.....	13	1,325	3	313	3	22	2	4
Osborne.....		323						5
Ottawa.....	1	42		1		5		
Pawnee.....	3	50		230				
Phillips.....		97		14			1	21
Pottawatomie.....	3	97	1	17	1	5	1	
Pratt.....	1	2				3		
Rawlins.....		20						
Reno.....	3	4	2	6	4	216	1	
Republic.....		32					1	62
Rice.....	4	460		14	1	8		
Riley.....	4	123	3	4		2	1	148
Rooks.....		109				3		50
Rush.....		19		78				
Russell.....		3						3
Saline.....						3		62
Scott.....		24						4
Sedgwick.....	3	62	7	205	1	675	1	
Seward.....								
Shawnee.....	82	1,592	28	418	26	165	4	31
Sheridan.....								
Sherman.....	1							
Smith.....	1	554						31
Stafford.....	3	50	2	3	22	80	1	3
Stanton.....	2	98					1	1
Stevens.....		24						
Sumner.....	3	255	2	12	7	438	1	
Thomas.....	1	39		1				1
Trego.....		87						
Wabaunsee.....	3	18	1	22	1		1	
Wallace.....								3
Washington.....	3	139	1	1			2	16
Wichita.....		2						
Wilson.....	11	568	1	159	3	40	2	35
Woodson.....	10	285	2	70	5	92	3	10
Wyandotte.....	85	5,068	162	7,187	127	4,338	14	392

VINEYARDS, GARDENS, FRUITS, VEGETABLES.

Acreage, 1921; production, 1920.

COUNTIES.	Vine- yards, acres.	Eight pound baskets of grapes.	Commercial gardens.		Home gardens.		Value of all fruits.
			Acres.	Estimated value.	Acres.	Estimated value.	
The State.....	2,016	215,475	7,512	\$1,051,680	11,075	\$1,550,500	\$1,721,455
Allen.....	23	8,873	67	\$9,380	93	\$13,020	\$24,297
Anderson.....	20	1,123	75	10,500	200	28,000	10,137
Atchison.....	59	1,911	9	1,260	83	11,620	60,232
Barber.....	18	105	15	2,100	80	11,200	1,654
Barton.....		46	47	6,580	26	3,640	1,049
Bourbon.....	9	1,298	17	2,380	113	15,820	12,793
Brown.....	36	4,561	28	3,920	249	34,860	40,753
Butler.....	9	375			136	19,040	1,107
Chase.....	7	223			86	12,040	2,467
Chautauqua.....	26	2,308	17	2,380	134	18,760	5,407
Cherokee.....	10	320	182	25,480	88	12,320	5,055
Cheyenne.....		20			25	3,500	993
Clark.....	5	944	3	420			584
Clay.....	9	23			200	28,000	4,677
Cloud.....	5	231	43	6,020	99	13,860	838
Coffey.....	25	1,440	39	5,460	142	19,880	14,377
Comanche.....		100	4	560	2	280	77
Cowley.....	63	7,723	425	59,500	259	36,260	40,033
Crawford.....	14	702			254	35,560	2,074
Decatur.....		46	18	2,520	16	2,240	2,892
Dickinson.....	17	631	8	1,120	159	22,260	4,648
Doniphan.....	269	79,815	55	7,700	83	11,620	510,043
Douglas.....	49	2,622	206	28,840	270	37,800	36,910
Edwards.....							35
Elk.....	8	410			123	17,320	2,783
Ellis.....		20	15	2,100	2	280	513
Ellsworth.....		21	11	1,540	105	14,700	783
Finney.....	1	35	112	15,680	17	2,380	1,253
Ford.....		64	24	3,360	36	5,040	344
Franklin.....	64	2,659	126	17,640	333	46,620	19,536
Geary.....	3	3	34	4,760	43	6,020	315
Gove.....					31	4,340	221
Graham.....		5	5	700	60	8,400	1,316
Grant.....		5			11	1,540	105
Gray.....							
Greeley.....							14
Greenwood.....	14	604	12	1,680	129	18,060	7,212
Hamilton.....					10	1,400	740
Harper.....	6	100	32	4,480	20	2,800	3,002
Harvey.....	13	790	190	26,600	153	21,420	2,928
Haskell.....							
Hodgeman.....					21	2,940	
Jackson.....	37	2,636	31	4,340	367	51,380	19,925
Jefferson.....	57	899	8	1,120	270	37,800	63,463
Jewell.....	4				113	15,820	1,876
Johnson.....	96	2,329	154	21,560	184	25,760	32,749
Kearny.....					4	560	640
Kingman.....	33	5,875	9	1,260	190	26,600	5,852
Kiowa.....	1	47	8	1,120	7	980	528
Labette.....	21	268	129	18,060	159	22,260	8,160
Lane.....					9	1,260	1,179
Leavenworth.....	30	5,103	117	16,380	208	29,120	112,061
Lincoln.....	1	30	9	1,260	75	10,500	664
Linn.....	7	685	6	840	146	20,440	28,211
Logan.....		15	33	4,620	2	280	1,356
Lyon.....	23	276	158	22,120	39	5,460	2,068
Marion.....	19	783	21	2,940	188	26,320	1,945
Marshall.....	59	558	82	11,480	257	35,980	7,453
McPherson.....	9	126			167	23,380	3,432
Meade.....	2	761	10	1,400	65	9,100	2,065

VINEYARDS, GARDENS, FRUITS, VEGETABLES—CONCLUDED.

Acreage, 1921; production, 1920.

COUNTIES.	Vine- yards, acres.	Eight pound baskets of grapes.	Commercial gardens.		Home gardens.		Value of all fruits.
			Acres.	Estimated value.	Acres.	Estimated value.	
Miami.....	24	810	4	560	187	26,180	21,407
Mitchell.....					65	9,100	1,026
Montgomery...	29	7,229	31	4,340	72	10,080	14,765
Morris.....	18	44	6	840	170	23,800	873
Morton.....					4	560	38
Nemaha.....	60	2,089			366	51,240	28,236
Neosho.....	34	2,725	89	12,460	277	38,780	5,527
Ness.....		17	7	980	10	1,400	916
Norton.....		50	8	1,120	31	4,340	1,793
Osage.....	24	327	11	1,540	288	40,320	9,384
Osborne.....		12			97	13,580	1,935
Ottawa.....	4	206	20	2,800	85	11,900	3,303
Pawnee.....	1	140			44	6,160	5,450
Phillips.....	3	62			145	20,300	3,598
Pottawatomie..	30	840	10	1,400	241	33,740	7,435
Pratt.....	1	461	28	3,920	2	280	1,503
Rawlins.....		20			13	1,820	1,693
Reno.....	28	6,236	607	84,980	465	65,100	25,480
Republic.....	9	208			222	31,080	2,245
Rice.....	4	164	11	1,540	22	3,080	4,434
Riley.....	17	119	21	2,940	53	7,420	1,403
Rooks.....		17	15	2,100	38	5,320	4,270
Rush.....					39	5,460	604
Russell.....		8			17	2,380	1,121
Saline.....	12	335			106	14,840	756
Scott.....			11	1,540	14	1,960	229
Sedgwick.....	42	6,622	461	64,540	195	27,300	74,865
Seward.....	1	6			28	3,920	32
Shawnee.....	79	2,606	1,538	215,320	171	23,940	29,654
Sheridan.....					10	1,400	396
Sherman.....			18	2,520	11	1,540	54
Smith.....	1	200	22	3,080	83	11,620	5,615
Stafford.....	22	1,253	29	4,060	90	12,600	2,474
Stanton.....		6	15	2,100			372
Stevens.....		47			2	280	112
Sumner.....	18	708	286	40,040	124	17,360	111,809
Thomas.....					15	2,100	365
Trego.....					2	280	376
Wabaunsee....	15	475			128	17,920	5,903
Wallace.....					20	2,800	217
Washington....	29	554	40	5,600	179	25,060	6,298
Wichita.....					63	8,820	133
Wilson.....	25	405	37	5,180	56	7,840	6,338
Woodson.....	11	727			209	29,260	8,783
Wyandotte....	293	39,200	1,593	223,020	275	38,500	200,411

FRUIT GROWN IN 1920.

COUNTIES.	Apples, bushels.	Pears, bushels.	Peaches, bushels.	Plums, bushels.	Cherries, bushels.
The State.....	726,059	12,744	50,829	2,774	19,684
Allen.....	5,064	428	1,790	61	91
Anderson.....	630	96	2,161	7	73
Atchison.....	27,634	98	127	5	51
Barber.....	945	11	10		10
Barton.....	198	12	72	4	47
Bourbon.....	3,376	154	1,671	28	73
Brown.....	15,604	964	2,009	241	647
Butler.....	233	13	173	3	9
Chase.....	1,395	23	52		40
Chautauqua.....	973	4	19	18	9
Cherokee.....	2,026	26		5	58
Cheyenne.....	212	11	50	39	81
Clark.....	60	30	25		
Clay.....	322		277	2	198
Cloud.....	37	2	23		144
Coffey.....	2,824	101	1,076	59	71
Comanche.....	25				
Cowley.....	20,228	355	25	3	156
Crawford.....	631	47	17	14	14
Decatur.....	1,074	53	20	2	541
Dickinson.....	93	1	168	1	93
Doniphan.....	266,197	1,967	237	38	229
Douglas.....	15,044	400	1,609	31	45
Edwards.....			6		
Elk.....	332	50	183	2	412
Ellis.....	157	1	14	21	44
Ellsworth.....	115		23	3	123
Finney.....	125	6		14	109
Ford.....	25		12		33
Franklin.....	2,279	819	1,932	206	250
Geary.....	57	7	66		11
Gove.....	10	5	9	23	57
Graham.....	228	13	67	1	87
Grant.....	10		1	21	15
Gray.....					
Greeley.....			1	5	2
Greenwood.....	1,569	60	875	79	71
Hamilton.....	349	10	1	30	44
Harper.....	1,902	5		1	3
Harvey.....	559	14	244	4	40
Haakell.....					
Hodgeman.....					
Jackson.....	6,547	287	677	84	513
Jefferson.....	37,347	102	241	11	62
Jewell.....	205	35	215		436
Johnson.....	2,930	864	5,112	168	965
Kearny.....	205			10	4
Kingman.....	1,863	8	27	4	5
Kiowa.....	140	6	33	12	56
Labette.....	1,777	156	493	141	183
Lane.....	487			6	16
Leavenworth.....	64,567	440	1,442	77	241
Lincoln.....	75	9	48		80
Linn.....	15,712	69	802	7	16
Logan.....	807	6		3	38
Lyon.....	192	7	55		
Marion.....	381	28	63	10	107
Marshall.....	1,358	97	515	31	592
McPherson.....	1,904	2	86	7	66
Meade.....	368	4	26		40

FRUIT GROWN IN 1920—CONCLUDED.

COUNTIES.	Apples, bushels.	Pears, bushels.	Peaches, bushels.	Plums, bushels.	Cherries, bushels.
Miami.....	2,898	442	4,793	53	171
Mitchell.....	17	30	90	5	74
Montgomery.....	451	37		5	37
Morris.....	403		72		18
Morton.....			4		5
Nemaha.....	8,260	344	1,722	116	521
Neosho.....	230	32	33	6	27
Ness.....	528	6	7	22	17
Norton.....	473	33	38	9	198
Osage.....	1,169	121	275	27	69
Osborne.....	101	23	44	23	207
Ottawa.....	244	22	625	20	364
Pawnee.....	2,510	29	96		19
Phillips.....	1,162	35	58	25	537
Pottawatomie.....	2,139	54	702	9	622
Pratt.....	566	6	66		122
Rawlins.....	492	34	8	8	392
Reno.....	11,883	47	1,317	29	83
Republic.....	426	59	251	17	174
Rice.....	693	6	478	17	67
Riley.....	85	9	63	5	57
Rooks.....	1,709	15	102	103	287
Rush.....	43	29	9	2	6
Russell.....	156	1	90		297
Saline.....	72		4		148
Scott.....	65			8	8
Sedgwick.....	44,284	157	449	38	94
Seward.....	20				
Shawnee.....	10,109	64	1,363	7	432
Sheridan.....	51		5		150
Sherman.....	36				
Smith.....	535	4	173	18	1,066
Stafford.....	77	11	348	9	129
Stanton.....	8				6
Stevens.....					5
Sumner.....	72,325	32	30	10	88
Thomas.....	65				62
Trego.....	40	1		3	2
Wabaunsee.....	2,513	72	381	112	124
Wallace.....	54			26	31
Washington.....	1,608	94	626	22	531
Wichita.....	2	3		6	52
Wilson.....	801	23	92	3	866
Woodson.....	2,115	175	1,069	21	36
Wandotte.....	45,232	2,788	10,466	439	4,142

FORESTRY STATISTICS, 1921.

COUNTIES.	Street trees, number.	Wild timber, acres.	Walnut, acres.	Locust, acres.	Cotton- wood, acres.	Catalpa, acres.	Other varieties, acres.
The State.....	398,985	344,358	4,428	11,141	14,279	9,935	30,975
Allen.....	2,253	2,335	112	.....	10	11	388
Anderson.....	6,722	6,482	70	2	.....	18	298
Atchison.....	5,662	6,844	16	.....	1	3	474
Barber.....	3,704	3,242	25	146	38	68	793
Barton.....	4,129	961	9	115	238	71	20
Bourbon.....	.....	3,525	25	1	.....	9	159
Brown.....	762	5,682	71	4	15	14	102
Butler.....	1,514	4,467	8	12	10	12	117
Chase.....	1,938	4,555	.....	.....	.....	24	5
Chautauqua.....	1,035	11,951	12	5	1	3	169
Cherokee.....	1,244	4,069	5	13	15	1	499
Cheyenne.....	321	67	55	401	156	.....	372
Clark.....	2,077	17	404	258	59	5	105
Clay.....	1,575	4,085	.....	.....	333	6	255
Cloud.....	2,782	3,161	6	.....	10	10	111
Coffey.....	1,945	5,111	6	22	11	21	290
Comanche.....	.....	316	5	71	64	31	.....
Cowley.....	1,383	6,940	35	24	46	410	445
Crawford.....	2,953	2,097	2	.....	.....	14	16
Decatur.....	877	1,664	114	33	98	29	346
Dickinson.....	1,733	4,103	33	35	536	100	372
Doniphan.....	520	7,661	3	9	1	1	3,637
Douglas.....	17,022	11,437	135	2	3	33	5
Edwards.....	1,915	.....	.....	10	70	35	46
Elk.....	1,370	3,960	9	.....	2	13	39
Ellis.....	15,098	1,624	27	1,165	290	1	49
Ellsworth.....	3,797	4,055	7	81	55	2	171
Finney.....	2,273	6	.....	2	11	4	1
Ford.....	2,897	501	8	580	123	408	52
Franklin.....	4,708	9,107	208	1	.....	42	.....
Geary.....	931	3,178	24	2	.....	3	55
Gove.....	380	114	314	1,976	3,093	31	2,357
Graham.....	422	349	2	21	80	14	444
Grant.....	1,394	.....	1	4	1	2	.....
Gray.....	728	.....	.....	5	9	.....	.....
Greeley.....	.....	224	.....	430	23	3	.....
Greenwood.....	1,707	6,775	74	16	.....	468	43
Hamilton.....	.....	209	1	206	333	34	16
Harper.....	9,360	293	11	286	234	433	140
Harvey.....	1,184	403	288	300	937	149	860
Haskell.....	.....	.....	.....	.....	.....	.....	.....
Hodgeman.....	.....	169	.....	10	1	.....	.....
Jackson.....	10,239	7,740	12	1	.....	36	61
Jefferson.....	615	15,049	173	.....	.....	23	109
Jewell.....	9,703	8,098	7	26	63	13	207
Johnson.....	4,381	3,299	139	27	12	19	.....
Kearny.....	2,401	.....	.....	38	22	.....	.....
Kingman.....	940	204	47	653	376	536	414
Kiowa.....	1,229	250	.....	485	77	31	90
Labette.....	6,544	2,825	22	500	.....	56	6
Lane.....	77	166	.....	4	6	.....	1
Leavenworth.....	1,183	7,405	4	.....	2	12	.....
Lincoln.....	2,129	2,478	1	24	33	8	21
Linn.....	921	12,690	36	.....	.....	.....	77
Logan.....	1,076	37	12	9	44	7	5
Lyon.....	1,775	4,012	.....	1	.....	46	684
Marion.....	34,331	1,655	98	187	65	350	103
Marshall.....	6,248	11,631	422	.....	13	134	180
McPherson.....	17,724	3,401	53	21	347	44	302
Meade.....	1,073	714	.....	52	48	74	20

FORESTRY STATISTICS, 1921—CONCLUDED.

COUNTIES.	Street trees, number.	Wild timber, acres.	Walnut, acres.	Locust, acres.	Cotton-wood, acres.	Catalpa, acres.	Other varieties, acres.
Miami.....	664	5,905	3	1	7	12
Mitchell.....	4,573	1,947	265	58	300	235
Montgomery.....	42	4,360	105
Morris.....	19,618	3,145	7	7	64	2
Morton.....	4	25	2	83
Nemaha.....	2,329	10,505	52	1	18	6
Neosho.....	1,832	4,909	3	2	18	45
Ness.....	1,551	407	253	301	4	12
Norton.....	498	2,301	1	49	24	64
Osage.....	5,197	4,235	75	3	13	562
Osborne.....	3,466	4,380	32	84	34	7	67
Ottawa.....	2,114	3,263	51	20	113	24	194
Pawnee.....	5,152	106	5	50	157	32	393
Phillips.....	2,164	4,611	14	11	27	3	132
Pottawatomie.....	964	14,098	3	4	22	61
Pratt.....	63	10	79	93	40	5,121
Rawlins.....	2,369	814	221	11	10
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